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FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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OBSERVATIONS UPON THE COMPARATIVE ADVANTAGES AND INCONVENIENCES OF THE EMPLOYMENT OF IRON WIRE, OR BAR-IRON, IN THE CONSTRUCTION OF SUSPENSION-BRIDGES OF GREAT SPAN.

BY M. LE BLANC, CHIEF ENGINEER OF BRIDGES AND ROADS.

Cables of iron wire, and chains composed of bars of wrought-iron, may be compared with reference to their economy and their durability. As regards economy, the question scarcely deserves discussion, and it is easy to prove *à priori* that, in all possible cases, iron wire has the advantage over wrought-iron. In fact, the Council of the Ponts et Chaussees has adopted the principle, that cables of iron wire should be submitted to a tension of 12 kilogrammes (26½ lbs.) per square millimetre (·0016 square inches) of section; but for bar-iron it was decided that that the *maximum* of tension shall not exceed 8 kilogrammes (17·6 lbs. nearly). This principle is founded upon the comparative resistances of iron wire, No. 18, ordinarily employed in the construction of cables, and of iron bars 3 to 6 centimetres (1·2 to 2·4 inches) in diameter.

The natural consequence of this principle is, that the section of a chain should be greater by one-half than that of a cable, for the same tension; this involves a proportional increase of its weight. In cables of iron wire no joints are used, or at most, but a single one, as in the bridge of Argentat, and this joint made up of two small eyes, weighs but little—on the contrary, they are numerous in chains, and where the system is rather complicated, as I shall prove it should be in bridges of great span, each one of these joints weighs at least 140 kilogrammes (309 lbs.). On the supposition that the suspension rods are 1·2 metre apart (47½ inches), as there is a joint for each rod, there will be 233 kilogrammes (514 lbs. nearly) for a bridge of 180 metres (590 ft.) span. This additional weight, together with that of the bars themselves, which, as we have just seen, is one-half greater than that of the cables, produces an excess of tension which must again be resisted, whence there arises a new increase of section, and consequently of weight in the chains. In applying these principles to individual cases, it is found that the weight of the unit of length of a system of chains exceeds double that of a system of cables.* Now, as the price of iron wire is once and a half that of bar-iron, it is plain that the use of iron wire is more economical than that of wrought-iron.

I have proved that the total tension is much greater when chains are used, it follows that greater strength must be given to the moorings and to the intermediate piers, when the bridges have several openings or bays—a new cause of increase of expense.† It appears to us to have been thus thoroughly proved, that in regard to economy, the cables of iron wire are superior to chains of wrought-iron. Let us now compare the two systems in relation to their durability. The principal objections which have been made to the employment of iron wires are the following:—

1st. They offer greater chances for rapid oxidation.

2d. The imperfection of the present process for manufacturing the cables does not allow us to give an equal tension to all the wires, so that when the cables are raised to their places the wires which are under most tension have to support many pounds in excess—while those under least tension do not draw at all.

3d. Cables form a system less rigid than chains of wrought-iron do, so that the horizontal oscillations of the roadway are more considerable in the former than in the latter case.

I believe that I have not withheld any of the objections urged against the employment of iron wire, nor weakened those I have presented. I shall now examine them in order.

First objection.—They offer a much greater chance for oxidation.

It is certain that if we expose to alternations of dryness and humidity a bar of iron and a certain number of isolated wires, the sum total of their individual sections being equal to that of the bar, the surface attacked will be far greater in the wires, and in them the oxidation will be most rapid.

In confining ourselves to this general fact, without reference to any of the means employed by art for retarding this oxidation, it will be well to examine if even this inconvenience of the more rapid destruction of the cables is not more than counterbalanced by the advantages which they present. It is very evident that if the cables remain only forty years without being renewed, while the chains may last for 60 or 100 years, we must calculate what will be the amount at the end of forty years of the sum saved by the use of iron wire instead of bar-iron.

To render this more plain I will give an example. I suppose that a given suspension-bridge requires 200,000 kilogrammes (441,096 lbs.) of iron, (which was nearly the quantity for the bridge of Roche Bernard).

The expense of the system of suspensions	300,000 francs.
According to note (†), to replace the iron wire there must be used 454,545 kilogrammes of wrought-iron, which would cost.....	454,545 "
Saving in favour of iron wire.....	154,545 francs.

Now, this sum put at interest, will amount at the end of twenty-three years to 475,506 francs, and supposing that the cables must be entirely renewed at this time, there will still remain a surplus of 175,596 francs, which will be more than sufficient to produce at the end of another twenty-three years a new capital equal to the cost of the system of suspension. In the case which we have considered, cables of iron wire, lasting but twenty-three years, will then be preferable to chains of indefinite duration. The supposition that isolated wires will last twenty-three years without the necessity of being renewed, is not without foundation, and we shall produce a fact which strongly tends to confirm it.

M. Montgolfier, jun., having learned that a grating of iron wire from the church of St. Martin's, at Paris, was about being taken down, after having remained forty years without any repair, had the curiosity to prove these wires, after having carefully ascertained their number, and he was convinced that they had lost but one-fifth of their entire strength.‡ This loss of strength is not sufficient to require a complete renewal of the system of cables. But the most determined opponents of the use of iron wire confess that cables do not afford such facilities for oxidation as detached wires. The greasy substance which covers them affords a powerful preventive to rust—their union preserves them in the interior, more or less, from moist air—the ligatures are a still further obstacle to its introduction—and, finally, the careful superintendence which should be given, are all reasonable motives for hoping that the effects of oxidation may be diminished in a remarkable manner.

It may be objected that experience has not fully confirmed the opinion, however probable it may be, that cables are less susceptible of the attacks of oxidation than iron wires. I confess that no one fact can as yet, incontestably, prove the justice of this opinion, but there are several which we can produce, capable of giving much strength to it.

The bridge of Tournon has been in existence eleven years, but no very considerable trace of oxidation has manifested itself, at least, to my observation, upon the surface of the cables; and if there existed any in the interior it would not have failed to show itself by a browniah stain upon the outside of the paint which covers them.

A bridge of iron wire was built at Brest, in 1526; the cables exposed to the salt air, which attacks iron with so much energy, should have undergone a remarkable deterioration in the space of three years, M. Trotte de la Roche, Chief Engineer, who, on account of the plans adopted for the port, was obliged to dismount it, took the pains, at the invitation of M. Inspector General Lamblardie, to prepare a *process verbal* of the state in which he found the cables.

It appears from the *process verbal*, 1st. That the continuous ligature which covered the cables was slightly attacked, but that by the first scratch of the file the oxidised portion was removed. 2d. That the exterior wires of the cables showed slight traces of oxidation, but that the slightest scratch of the file caused them to disappear. (M. Trotte de la Roche supposes that the oxide was only deposited upon the wires of the cables, and that it came from the ligatures). 3d. That the interior wires were perfectly untouched. Eight years is a short space of time, but if we consider that the effects of oxidation probably continue to decrease, we may conclude that they are not so very rapid, but that the fears entertained upon this point are greatly exaggerated. An observation has been made which is worthy of remark; it is, that in chains the surface of the bars which is attacked by oxidation proves the portion of them offering the most resistance, while in a cable the interior portions have the same strength with the others.

Second objection.—The imperfection of the present process for manufacturing the cables does not allow of an equal tension in all of the wires, so that when the cable is raised to its place the wires under most tension are overstrained by many pounds, while those under the least tension do not draw at all.

This last objection is a serious one, and cannot be absolutely done away with—that is to say, it is impossible to prove that this defect does not deserve the most serious attention; but we can employ, in defence of iron wire, negative arguments, or, in other words, we can prove that it is not possible to resolve the problem of equal tension in a more perfect manner by the system of chains than by that of cables of iron wire. We must, in the first place, distinguish carefully between bridges of large or small span; in the latter, where the tension requires only a section of the chains equal to that of 4 to 8 bars of about 0·05 metres to 00·6 metres (2 to 2½ in.) in diameter,‖ (dimensions beyond which the quality of the iron becomes considerably deteriorated), we can establish on each side of the bridge two or four separate chains in one or two layers, each chain being made of a single bar only; in these two cases the problem of equal tension is perfectly resolved, and although in the second each suspension rod bears upon two chains which cannot have exactly the same curvature, the holding plate of the rods will always bear upon the two chains, which will then support equally their share of the whole weight of the bridge. By establishing three or even four layers,§ we can form an excellent system of 16 chains, each made of a single bar; but these 16 chains present only a total section of less than 44,000 millimetres (97,041 lbs.), corresponding to a tension of 352,000 kilogrammes (776,329 lbs.)—that is to say, to bridges of medium span; but if we pass to bridges of such a span that the tension increases to more than a million of kilogrammes, it will be necessary that the chains should be composed of 48 or even 64 bars—that is, 24 or even 32 bars on each side.

Let us consider the last hypothesis, which applies to the case of the bridge of Roche Bernard. It is impossible to employ the simple system of suspension rods resting upon a couple of chains, of single bars, and arranged in layers, for we would then have sixteen of these layers, one above the other, which, beside the inconvenience presented by a considerable height, would allow of the attachment of suspension rods only at every sixteen intervals upon the same chain. Here, then, it is necessary to employ a more complicated system—viz., to form the chains of several bars fastened together by a single bolt—in this case I would reduce the number of chains to eight, and form them of eight bars, fastened by one bolt. We can double the number of chains, and so reduce to four the bars in each, by making each rod rest, by means of plates, upon two chains at once, but if the two chains forming the couple are not in the same plane, the upper plate of the rods will bear only upon one of the chains—for it must remain parallel to the plane of the four bars—and one-half of the system will support nothing; this disposition is too faulty to be adopted—this is my opinion in the hypothesis of eight bars to each chain and fastened by one bolt.

Whatever may be the manner of forming the eye at the end of the bar, either by welding it to the end itself, or by bending over a portion of the bar, it appears to me very difficult to prevent differences in length of at least a millimetre between the bars. Now, if there is this difference between bars, 5 metres (16·4 feet) in length, the shortest must lengthen a millimetre, or ·0002 of their length before the others draw. But we know that a tension of two kilogrammes per square millimetre of section produces upon a bar an elongation of ·0002 of its length. The bars, then, of which we are now speaking, are strained to the amount of 4 kilogrammes (9 lbs.), per square millimetre, before those beside them suffer any tension; what will this amount to if the differences in length are more than one millimetre?

We see, then, that the problem of equal tension is as difficult of resolution for a complicated system of chains as for iron cables, for supposing that in the two systems, the excess of tension, either of one wire over another, or of one bar over another, is the same, this excess will be a much smaller fraction of the absolute strength of wire than of bar-iron; moreover, the manufacture of cables affords a greater hope of perfection than that of chains.¶ We see now that the second objection has no more weight than the first, to decide us in favour of wrought iron chains.

On the other hand, there are objections against the employment of bar-iron more difficult to remove, and which will give additional strength to the reasons which have induced me to yield the preference to iron cables. These objections are as follow:—

1st. The greater part of chain bridges which have fallen have given way at the bolts which unite the links. Now, it is extremely difficult to calculate the strength which should be given to them, as we do not perfectly understand the manner in which they resist the strain; if we compare them to bars placed upon fixed bearing points, and charged with a weight in the middle, and the resistance of which is derived from a formula $P = M\frac{a b^2}{2 c}$, we find the dimensions very small—too small, indeed, according to many experiments. If we suppose them to resist, as if drawn in the direction of their length (and many constructors admit this hypothesis), we arrive at large sections, which greatly increase the weight of the joint; besides this, we have no certain information as to the quality of the iron which they need; it should not be so soft as that of the chains, because no curvature is required, but still it should not be brittle. To avoid mistakes prejudicial to the durability of the work, it is wise to make them rather too strong than too weak, but as I have just said, an increase of weight is the consequence of this precaution.

2d. The making of the eye requires great attention; it has been observed, that when the bolt is too little, during the proof, a rent takes place from the outside to the inside of the head of the eye; when the bolt is too large, the rent opens from the inside toward the outside. Now, as it is almost impossible that the work of man should be perfect, in order to avoid the inconvenience abovementioned, several constructors have proposed to swell out the head of the eye, in order to give it greater strength; but, to do this, we must re-disturb the particles of iron, by hammering after having heated it—an operation which I have already designated as faulty.

3d. During the oscillatory motions, which take place in all suspension-bridges, the irons rub forcibly against each other at all the joints, and this tends to wear them in those parts which have the greatest strain. This inconvenience does not exist in wire cables.

4th. In the moorings we are compelled to use curved irons, which have, of course, been re-heated,* and are most often squared; this new heating, and the difficulty of proving them, obliges us to give a greater size, which involves another increase of expense.

5th. In very cold weather iron becomes brittle; wire, enveloped in grease, and not in immediate contact with the air, must be less brittle than naked bars of iron.

6th. Cables in bridges of great span can be much more easily raised to their places than chains. In the proposal for the bridge of Roche Bernard, I have calculated that the weight of a cable would be 7968 kilogrammes (17,673 lbs.), while each chain would weigh 31,496 (69,462 lbs.); a work equally difficult, it may be said, has been executed at the Menai-bridge; but if this proves that it is not impossible, it does not prove that it is not very difficult.

M. Vicat has asserted, that wires before breaking, suffer a considerable elongation, which announces the rupture beforehand, and thus gives time to make the necessary repairs, while chains break instantaneously. This advantage of iron wire has been disputed, in the case of wires united in bundles by ligatures, and the interstices of which are filled by grease. M. Frinot thinks that these bundles form a brittle system; he, doubtless, would like to say, as brittle as bar-iron. In support of his opinion he has cited the "herse," a sort of skein of hempen thread, which has most strength when its elements are free, and loses part of it as soon as the loose threads are bound together, and approximated to the condition of ropes. If this assertion is confirmed by experiments—and I have prepared some for this purpose—cables will, in this point of view, be neither worse nor better than bar-iron.

Third objection.—Cables form a less rigid system than bars of wrought-iron, so that the horizontal vibrations of the roadway are much greater in the former than in the latter. For equal curves and weights this is true, but when we have once given the preference, even in point of durability, to wire over bar-iron (and I confess I have done so), will we not gain more by increasing the rigidity, by means of the greater weight of heavier timbers for the roadway, and by diminishing the curvature of the cables, or the tension which they should bear per square millimetre of section, than by substituting chains for cables? These latter likewise admit of an arrangement which cannot be adopted for chains. I refer to the cradle form;‡ and, in this case, the outside cables being in a plane, inclined from the vertical, have a tendency to draw the whole roadway towards them, and as this takes place on both sides, it follows that the roadway is kept in its position better than it would be by means of stays.

I offer these reflections to the readers of the *Annales*, as the result of perfect conviction in my own mind, after deliberate consideration, and I can indulge the hope that this conviction will be shared by at least a small number of my associates. I shall examine, in a subsequent article, the advantages and inconveniences of a diminution of curvature, and the defects in the proof which chains and cables undergo, either before or after being placed.—*Annales des Mines.*

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* In the comparative proposals which I presented for the bridge of Roche Bernard, I showed that these weights are in the proportion of 11 to 31; in order to replace 11 kilogrammes (24 lbs.) of iron wire, which at 1f. 50c. cost 16f. 50c., we must employ 31 kilogrammes (68 lbs.) of wrought iron with 31 voices.

† In bridges of several bays the cables or chains should be fixed to the intermediate piers, in order to avoid the great changes of form which result from unequal loads upon the two bays, if the chains and cables can slide freely over the top of the piers; because these piers have to resist only the difference of the fractions produced by different additional loads upon the two bays, it would appear at first sight a matter of indifference whether the permanent loads which are in equilibrio are greater or less; nevertheless, it is plain that the less these permanent loads are, the better the piers are in condition to resist the enormous load of one bay, the other being charged—if be, then, still unimportant that we diminish the permanent load as much as possible.

‡ The increase of oxidation is not as rapid as would be supposed from the first observations made—for the first layer of rust which covers the surface of a bar of iron, instead of favouring this oxidation, protects a coating which is an obstacle to it.

‖ I reserve on the supposition of the use of round iron, of which I need not prove the superiority over square iron, that is homogeneous again after being reheated to a cherry red.

§ I suppose it would not be desirable to employ more than four layers—this number is already considerable and troublesome in the passage over the towers and in the moorings.

¶ To make the bars as equal as possible, we can, indeed, after having bent and welded the ends, drift through all of them which make up a link of the chain, when cold; but it is evident in this case, that to prevent the drifting from diminishing the strength of the eye, we must either give greater size to the bar in this part or darken it, producing a hooking which betrays the quality of the iron.

* There are, for instance, some red stones (not chalk) from which iron nothing by being wrought at a white heat, but which are injured in quality when wrought at a less elevated temperature. But the workmen cannot confine themselves to this. In these circumstances (and it often happens in localities where there are these stones), that the infirmed portion becomes hard, and, consequently, that only the hard portion can give evidence of this imperfection; but, as we have just said, it is very difficult to prove the red hard.

GEOLOGICAL NOTICE OF THE DISTRICT OF MANCHESTER.

BY R. W. BINNEY, ESQ.

The geology of Manchester and its vicinity has perhaps been less investigated than that of any other large town in the kingdom; this assertion may appear extraordinary, when we consider how much our town owes to the mineral treasures of the earth for its commercial importance; but to all who are conversant with the subject, it will be admitted to be perfectly true. Manchester is situated on a part of that extensive deposit of drift, or diluvium, which covers from our view so great a portion of the strata of the midland and north-western counties of England, skirting the sides of the Pennine chain, and enveloping the lower tracts of country. The appearances presented by this deposit are very variable—at one place it being composed of a coarse gravel; at another, of a stiff clay mingled with pebbles; and elsewhere, consisting of a fine forest sand. It is only on the great lines of drainage, or in artificial sections, that a view of the substrata is to be obtained. The rock underlying the area of the town of Manchester is the upper new red sandstone—the second member in the descending order of the formation of that name. This formation occupies a considerable part of England, and is chiefly remarkable from its overlying our true coal fields (most of which disappear under it), and from its containing those valuable mines of salt and gypsum, for the former of which the neighbouring county of Chester is so famous. The country to the north-west, north, and east sides of Manchester gradually rises to a considerable elevation above the site of the town; it is traversed by three valleys, along which flow the Irwell, Irk, and Medlock. These three rivers unite at Manchester, and, after a course of ten miles, fall into the Mersey at Irlam Green; thence this river winds its way along the new red sandstone plains of South Lancashire and Cheshire into the Irish Sea. The extent and depth of the valleys through which these rivers flow, generally indicate the geological features of the country; and it is in them that we find the only true natural sections. Of these valleys, that of the Irwell is by far the most extensive; for the distance of near five miles it is occupied on the north-west side by the carboniferous strata, and on the south-east by the upper new red sandstone. Those of the Irk and Medlock are of much less extent, being chiefly in the vicinity of the town through the coal measures; but, whenever they touch upon the new red sandstone their width visibly increases. The strata comprising the new red sandstone formation, in this neighbourhood, may be conveniently divided into the following (descending order):—1. The upper red marls. 2. The upper new red sandstone. 3. The red and variegated marls with magnesian limestones. 4. The lower new red sandstones. The whole of these deposits are very rarely, if ever, seen together; the upper marls having frequently been removed by denudation, and the upper sandstone overlying the two inferior strata. But in one or two places we find the two last entirely wanting, and the upper sandstone resting on the carboniferous strata. To a superficial observer, the only rock occurring in this neighbourhood would appear to be the upper sandstone; the lower marls and lower sandstone being only seen in one or two places at the surface; coal workings and springs for water, however, generally prove their existence.—*Trans. Manchester Geological Society.*

INAUGURAL ADDRESS of R. I. MURCHISON, Pres. G.S.,

DELIVERED AT THE FIRST GENERAL MEETING OF THE DUDLEY AND MIDLAND GEOLOGICAL SOCIETY.

The learned Professor commenced by congratulating the gentlemen present on having the spirit and discernment to establish the Dudley and Midland Counties Geological Society. Having laboured to become acquainted with the structure of the district, and having offered proofs to the public of his deep sense of the importance of the natural phenomena in which it abounded, he might, he hoped, be permitted to say, that he viewed the formation of the institution with peculiar satisfaction, and to state his conviction that its labours would have a permanent beneficial influence. The two conditions which were essential to the success of any association were to be found in their town and neighbourhood—namely, a sufficient number of subjects to excite research, and the existence of persons adequate to their investigation. The value and importance of local museums had already been tested in various parts of Great Britain, and such bodies would, in his opinion, best attain their end, if they endeavoured to illustrate perfectly their own neighbourhood, instead of encumbering their rooms with objects of general interest or curiosity. The attempt to form, in a provincial town, a miniature British Museum must necessarily fail, and could not advance science, for, with every effort to establish a collection, which must, after all, be very imperfect, the time and attention of the active members would be too much withdrawn from the consideration of the natural phenomena which surrounded them; he would, therefore, encourage them in the course which they had so well begun—a course which promised to render the Dudley Museum the normal school of whatever was most interesting in the geology of the Midland Counties. Amongst the points of geological inquiry to which he would direct their attention, in reference to the interesting district around them, he would mention—first, the illustration of the probable range and extent of their productive coal-field beneath the adjacent red sandstone by the analogy of the structure of the southern counties; secondly, the importance of extensive geological knowledge in those who sought for coal, in order to prevent local associations of strata from leading to futile undertakings; thirdly, an inquiry into the whole succession of palæozoic strata, and the probable formation of the coal beds, with the formation of which that era terminated; fourthly, by a reference to the boulder stones and gravel which encumbered large portions of this neighbourhood, he would endeavour to show how isolated phenomena were, by geological reasoning, connected with great questions of physical science; and, lastly, reverting to the foundation of the society, he would conclude by summing up its useful relations. In no part of England were more geological features brought together in so small a compass than in the environs of Dudley, or in which their characters had been more successfully developed by the labours of practical men, exhibiting the records of the past, the types of primeval life, and the evidences of the mighty operations which marked the more ancient conditions of their planet; or, if they turned from pure geological views to subjects of mineral value, in no region of the globe, of the same extent, had more wealth been extracted from the earth. If such were the case, then came the questions, to what extent had the means placed in their power been neglected? How far had resources been wasted? and sought not the failure and success of various mining operations to have been registered? Before proceeding to call attention to these subjects, he begged permission to say a few words on the social and commercial transition which the district had undergone in very modern times. In exploring recently the distant parts of Russia, he had examined the large carboniferous region of the southern provinces, between the Don and the Dnieper, which contained many seams of coal, and was destined, at some future day, to become, like Dudley, a great centre of industry. In those tracts the coal rose at many parts to the surface, and the peasants dug it out, in open or shallow pits, for their own use. From these wild and little inhabited steppes of the Don, imagination had transported him to their own district, saw the scene of a busy and industrious population. He contrasted the rude methods of their ancestors with the improved explorations of the present day, and the successive processes by which those improvements had been effected, for geology had now stepped in and taught them the important fact, that their so-called coal field was nothing more than the fragment of a large and thick carboniferous mass, which, by subterranean agency, had been broken off from its parent seat, and forced to the surface by previously underlying deposits, which still occupied the red sandstone region of the central counties. Now, as it had been demonstrated that coal of great thickness and excellent quality was really to be found under this red sandstone, so had he, on a former occasion, not only stimulated to perseverance those who had since been successful, but he had endeavoured to arouse public attention to the cheering anticipation, that when, in process of time, the wealth of certain tracts should have been exhausted, unexplored seams of carbonaceous matter might be sought for and found in the adjacent parts now covered by red sandstone and detritus; and here he would remark, that this element, in calculating the future mineral resources of Great Britain, though of such manifest importance to the nation, had not yet been taken into consideration in any of the public inquiries as to the probable extension and duration of the coal strata of their country. In fact, since the parliamentary investigation of that subject, geological research had discovered what might be termed the new coal kingdom of the central counties, and which he had no hesitation in saying would be most profitably explored far from the boundaries of the fields at present worked; for who, after the vigorous and successful enterprise of the Earl of Dartmouth, would any longer talk of the "great fault" which was supposed to encompass the Dudley coal-field, as any barrier to the discovery of a vast body of carbonaceous matter extending beneath the surrounding red sandstone; or ought they not rather to say, from the experience already afforded, that although such coal must be worked at a greater depth beneath that rock than where the mineral had been elevated to near the surface, the equable and undisturbed condition of its beds might even in a commercial sense more than countervail the expense of deep shafts? In short, his belief was, that they might even live to see the red tracts in question considered of as great value in relation to the old coal-fields of the country as the surrounding counties occupied by the magnesian limestone had proved to be to the Northumbrian and Durham coal-fields. Such, they might rely on it, would be the destiny of a large part of the surrounding region in which they were assembled. After entering into an interesting comparison of the northern coal fields and those of the central counties, Mr. Murchison proceeded to say, that it was usual in the present day to use arguments to prove that coal beds ceased totally at a "fault;" but the speculator might be almost certain, that, if he would persevere, the bed so terminated might be recovered beyond the line at which it had been snapped off. The works undertaken by Lord Dartmouth, and to which he had already alluded, had indeed practically determined this point; and, as geologists, they had only to say, that these facts were precisely in accordance with the nature of things, and with all the principles of their science. If, then, they started from the centre of vast carboniferous wealth, like that of Dudley, where the principal seam of coal had the enormous thickness of ten yards, a thickness far exceeding the united mass of all the Newcastle seams in any one shaft, why might they not infer that the great Dudley coal might be found to extend widely into the adjacent tracts? It was almost certain that a body of coal would be found to sweep under the grounds of Hagley and its environs, and how could they doubt that in proportion as deep mining was encouraged similar results would attend the future explorers of the hills of Himley? Nay, it was almost reduced to demonstration in the mind's eye of the geologist, that in the country lying between two such rich coal tracts as those of Wolverhampton on the east, and Cradley Dale on the west, coal would be found underneath the same red sandstone which was known to overlie so much carboniferous matter in other parts of this country. Now even on the eastern boundaries of the known coal fields could they attempt to circumscribe the prospects of future coal; for although the spirited works of Lord Dartmouth (who had first established the value of the opinion he was now advocating) taught them that there was a line of subterranean disturbance between the Barr Beacon and the Hawley Hills, which cut the coal, who would contend that that line of disturbance being once passed over (and all such lines were of small width) the same seams might not again be met with, though probably at greater depths, under the red sandstone of Birmingham itself; and then, indeed, might the great workshop of England extract fuel from its own subsoil. Confining his attention, however, to the great mining district more immediately around them, he urged upon those gentlemen present, and others engaged in mining operations, to lose no opportunity of collecting and recording all the facts which their numerous practical researches might hereafter present to them; for it was to the monographs of local observers that they must now look for the real and substantial advancement of general science; and he trusted they would never rest satisfied till, taking the Ordnance Map as their basis, and greatly enlarging it, they inserted upon it the countless phenomena with which their subterraneous labours had made them so well acquainted; so that when the period arrived for the geographical gentlemen employed by Government to visit them, they might find in Dudley and its neighbourhood as rich materials as his friend Mr. De la Beche had found in Cornwall and Devonshire, and which had enabled him so effectively to complete the mining details of his beautiful geological map of that district. In addition to other claims on their notice, he begged to remind them that, by virtue of the title of their society, they were called upon to give the earliest notice of the ordinary casualties their fellow-men amongst them. With the infinite variety of strata which they pierced, and with the great variety of fossil remains which they threw up, and which denominated into soil, no persons could have better means of experimenting upon substances, or could show more clearly how soil depended upon subsoil. Every geologist held in his hand the two great elements upon which the advancement of agriculture mainly depended—viz., the principles of drainage, and the decomposition of rocks; and therefore he trusted they would make the neighbouring farmers comprehend that they might lay in much useful knowledge by joining their institution. It was a difficult matter to convince the practical miner, who had never worked out of his own district, that there was not some connection between the coal of the Dudley country and the Silurian limestone with which it was there in contact, so very remarkably did the beds and folds of the one adapt themselves to those of the other. It was indeed a curious fact, that in no one instance which had come within his knowledge were the Silurian strata of the Dudley country more highly inclined than the carbonaceous strata which overlie them. If these rocks were in discordant positions, they would be all well aware that geologists would then assume that the lower of these two deposits had undergone great dislocation from its original condition before the accumulation of the overlying strata. After entering into an elaborate and interesting description of the peculiarities belonging to the coal-fields of Britain, as compared with those of Russia and different parts of Europe, exhibiting throughout a beautiful harmony with the principles of geological science, Mr. Murchison proceeded to remark that he had been induced to advert to these facts, which were probably known to most present, by the circumstance that even recently attempts had been made in their own district to pierce through Silurian rocks in search of coal; and hence the necessity of some indisputable evidence of the age of rocks, which geologists held out as beacons against improvident and foolish speculations. He then passed on to notice the beautiful fossil remains with which their district abounded, and of which the collections in their museum afforded abundant evidence. Though placed in the very centre of England, far removed from any mountain chains, their district was strewed over with superficial detritus, both coarse and fine. A considerable portion of this accumulation was doubtless nothing more than the debris of the coarse sandstone grits and conglomerates which once extended in a solid mass over the carboniferous strata, and were broken up in the protrusion of the plutonic rocks, which had pierced the strata at so many points. But besides this local detritus, there were also portions of far-transported rocks, the greater number of which had decidedly been derived from the north. There could be no reasonable doubt that these heaps and ridges of gravel, sand, and clay were formed under the waters, and composed those sub-marine accumulations designated drift; that they were heaped up under the sea, and that too at no distant geological epoch, seemed to admit of no question, since sea shells of existing species had been extensively found in them. Having adverted at length to the "glacial theory," and the opinions of M. Agassiz in reference to it, Mr. Murchison apologised for not having done more justice to the subject upon which he had undertaken to address them; but the life of a practical geologist, whose summers were spent in exploring untrodden tracts, and whose winters were occupied in describing them, must plead his excuse. The district in which they were assembled did indeed afford materials which might well have given rise to a general review of the progress and prospects of their science; and it would have afforded him real pleasure to have spoken out all his opinions on that chosen spot; but, as President of the the Geological Society of London, he must shortly appear before his fellow-labourers with an anniversary discourse, in which all such topics must be embraced; it would be impossible for him to anticipate what he should then have to deliver. He begged, however, in conclusion, to remark, that the foundation of the Dudley and Midland Society was one of the very best signs of the times, and a manifestation of that forward movement which had been impressed upon every department of science within the last few years. A number of auxiliary causes aided in accounting for this advancement, amongst which the labours of particular societies, the vast increase of education, and the powerful stimulus which was held out to an enterprising people by the positive value of scientific researches, had greatly contributed. Yet, with all these considerations, it must be admitted that a very decided propulsion had been given to the real advancement as well as to the diffusion of science, by the efforts of the British Association. It would not, he was sure, be forgotten, that independent of the useful researches which had been carried out at its own cost, or those in which it had enlisted the aid of Government, that association had, during the last eleven years, most powerfully roused the public mind to the value of the cultivation of science. In proof of this, he might refer to the good effects which the British Association had produced when Birmingham was its place of meeting, and when Dudley was the chosen ground of geological discussion. The elements, it was true, waged war against them, and the rain fell heavily; but they offered to the geologists assembled at the Association, as they now did to those whom he addressed, a shelter in their splendid excavations; and where, he would like to know, could they have found a more appropriate lecture room? It was (continued Mr. Murchison) to the visit of the association on the occasion to which he referred, that they had to trace the germ of the present society; it was that gathering of their forces which first made them sensible of the weapons which they could wield. From his long connection with the British Association, he (Mr. M.) had been able to trace to its exciting influence the spring of several institutions like their own. Thanks to the steady union of the men of science, and their efforts to reach those ends which were not to be compassed by individual enterprise, their rulers themselves had gladly adopted their suggestions, and accomplished statesmen had been ready to reciprocate with his brother-workmen in leading them to the contemplation of new fields of research; and on a recent occasion they had beheld the Premier himself, in the character of a public teacher, proclaiming that scientific advancement was now an indispensable element in national improvement. As, then, they lived in an era marked by such a rapid succession of discoveries, that he who lagged behind, even for a short time, could with difficulty rejoin the advancing columns, they would permit him to express the hope that they would not lose the opportunity which would be afforded to them of meeting together in the ensuing summer in Manchester, where the British Association would assemble under a president distinguished alike by his high station and great attainments; and where, he trusted, they would proceed to the discussion of subjects in which they were all interested, and some of which he had no doubt would be contributed by his associates, as the first fruits of the Dudley and Midland Geological Society. But what, after all, was the British Association, and what was their own society, but scientific emblems of the whole frame-work of their social condition? Every Englishman who had been a traveller in distant climes must, he thought, return to his own land impressed with the conviction, that in the virtue and intelligence of her proprietors and middling classes England contained the true elements of her greatness; and, looking around him, and judging from the experience of the past, he was convinced that, so long as good and patriotic leaders were found mingling with the many, and urging on their improvement, so long would their island, confiding in her own moral strength, stand up as the chosen citadel of well-balanced liberty and intellectual attainment. The list of patrons and members of their own society was a guarantee for the maintenance of this extraordinary bond of union—a union which, in their own immediate neighbourhood, was, indeed, most firmly cemented. The slopes of Sandwell were held by one who exhibited a good example to all around, by practically showing how to make the best use of the talent which had been entrusted to him—the shades of Hagley were still adorned by one who, to high personal character, added the classic attainments and genius of his sires—and on the present occasion they were justly presided over by a young nobleman whose benevolent conduct and intelligent views had already stamped him as the worthy successor of the vast possessions of the ancient house of Dudley. Under such auspices, and with such public spirit as they had already manifested, no gift of prophecy was required to foretel their success; and he, therefore, took leave of them in the full persuasion that the Geological Society of the Midland Counties would have an enduring and useful career.

We quote the following extracts from the report of the provisional committee, appointed to organise the society, presented at the same meeting:

"In tracing back the origin of the Dudley and Midland Geological Society, your committee feel that it will be necessary to revert to the meeting of the British Association, which was held at Birmingham in the autumn of 1839. Amongst the other proceedings of the association, the geological section made an excursion to the quarries and the limestone rocks of Dudley Castle and the Wren's Nest, and in order to render the opportunity thus presented to the members of the association of becoming acquainted with the prominent geological features of the locality as complete as possible, a collection of the fossils from the Silurian rocks and the coal measures of our neighbourhood was formed by the union of several private collections. This was thrown open to the members of the association, and to the public generally, and attracted so much attention from Dr. Buckland, Mr. Murchison, M. de la Beche, and other eminent geologists, that it was considered a source of much regret that so valuable a collection, and one so complete, as far as regarded the peculiar fossils of our own locality, should be broken up. * *

"One of the principal objects which this society was intended to effect was the formation of a museum, to contain a complete series of the fossils of this locality; and your committee feel that they cannot close this report without congratulating the members on the extensive and valuable collection which your curators have been enabled, at so short a notice, to form. They think that, without presumption, they may venture to boast that the museum contains a more complete and more perfect series of the fossils of the upper portion of the Silurian system than any which has been hitherto formed—indeed, they believe there is no one described species of the encrinites or trilobites, the two most beautiful classes of those fossils which belong to the Wenlock and Ludlow rocks, the upper members of the Silurian system, of which your museum does not contain some specimens; and in addition to those described in the valuable work of Mr. Murchison, they may mention amongst the curiosities upwards of fifteen new and undescribed species, some of them possessing characters of great interest. Besides these new species of encrinites, your museum contains several specimens of a remarkable curious fossil, apparently partaking of the character both of a pentremite and an encrinite; but as they are entirely distinct from anything yet described, your curators must content themselves simply with referring them to your attention, until they shall have been examined and described by some competent authority. Of the class of trilobites your museum contains sixteen distinct species, several of which also have not hitherto been described. Amongst these species previously known may be found some of the most perfect specimens which have yet been discovered. Your curators would especially refer to the splendid specimen of homolonotus from the Castle; to the Burmastus Barriensis from Walsall, to which locality it was till recently considered peculiar, although your museum now contains several specimens from the Dudley rocks; also to several interesting specimens of new species, either belonging or nearly allied to the curious genus Agidaspis. These specimens have all been recently discovered, and it is hoped that some light may be thrown upon their peculiar character by yet further additions to their number.

"But it is not merely to the fossils of the Silurian system that the attention of your curators has been directed; to the rich mine which our coal-field affords they are indeed indebted for some of the most valuable and most extraordinary fossils which your museum contains; and if they cannot challenge a comparison with some other collections, as far as regards the vegetable remains of these important measures, they may yet assert that there is not in existence any series of the fishes of the Staffordshire coal-field besides their own. The magnificent specimen of the Megalichthys Hibberti, perhaps the finest which has ever been found, must have struck the attention of all who have entered the museum; but although this splendid fossil does certainly seem, at first sight, to eclipse, in some degree, the smaller specimens of fossil fishes by which it is surrounded, yet many of these will be found amply to repay a close and attentive inspection. Among them are several portions, some remarkably perfect, of those curious sauroid fishes, belonging to the coal measures, which appear to form the connecting link between the fishes of the old red sandstone and the gigantic saurians of the later formations. Covered over with a perfect shield of the most beautiful enamel, on the beauty and delicacy of which the enormous time which has elapsed since they became deposited beneath the surface of the earth seems to have wrought no change, these fossils present a most instructive record of a small portion of the world's past history. They were evidently fishes of prey, as is to be seen from the character of their large and shark-like teeth; some of the specimens in your museum show that they possessed formidable spines, proceeding from the back, and the organs of locomotion with which they were endowed partake partly of the character of fins, and partly of that of paddles. Besides these sauroid fossils, your museum contains several distinct species of the genera Holoptychus and Palæoniscus, and some interesting specimens of the vertebræ, the single and double teeth, of large fishes, &c., as well as several species which your curators have not as yet been enabled to class; they are probably undescribed, though it is possible they may be found in the elaborate work of Agassiz.

"Your curators cannot conclude this brief notice of the fossil fishes of the coal measures which your museum contains, without alluding to the fact, that, till within a very recent period, this interesting class of fossils was almost unknown in this district. They feel confident that a more close and attentive search would amply reward any person who would engage in it. Your museum furnishes proof that fossil fishes range through nearly the whole extent of the coal measures; and there is every reason to believe, that so far from being rare, some of these measures abound with the fossil remains of fishes in yet greater number than with those of plants; but they are generally so closely imbedded in the ironstone in which they are found that it requires some penetration to be able at all times to discover them, and hence many good and valuable specimens are, doubtless, often lost.

"Amongst the vegetable remains of the coal-fields in this district, are to be found, in your museum, some valuable and perfect specimens; but this department, your committee hope, will be much extended, by the contributions of fossils from the various coal and ironmasters of the neighbourhood; those gentlemen who take any interest in the prosperity and the usefulness of this society, cannot, indeed, render greater service to it than by directing the attention of their ground bailiffs to the preservation of the various fossils that may be met with in their mining operations, with a view to their being ultimately deposited in your museum. Many valuable specimens might thus be preserved, which, in all probability, would otherwise be lost. It must be at once evident, that so fine a museum as the one this day thrown open to the public, could not have been collected together at so short a notice, unless your curators had been seconded in their labours by the valuable assistance of many friends to science. Desirous of rendering the series as complete as possible, your curators have availed themselves of the kindness of several private collectors, who have lent some of their most perfect specimens for this occasion; but a great, if not the greatest, portion of the fossils which your museum contains are already the property of the society. To Mr. Cornelius Cartwright, Mr. George Bennitt, of Himley; Mr. T. W. Fletcher, Mr. Cooper, of Bilston; Mr. John and Mr. Thomas Williams, Mr. Marsh, of the Burnt Tree; Mr. H. Beckett, of Wolverhampton; Mr. N. Tolly, Mr. Downing, Mr. Morris, Mr. Wainwright, Mr. Blackwell, and to your curators, Mr. Twamley and Mr. Gray, the thanks of this society are indeed due, for their valuable assistance and aid, both as regards the specimens they have lent from their private cabinets, and the donations they have made to the society.

"Your committee hope that the arrangement of the fossils according to the strata in which they are found will be generally approved. Some individuals may perhaps think that it would most facilitate the study of the science of palæontology, were the fossils to be arranged according to the classes to which they belong, and the individual species of which those classes are composed; but it must be recollected that geology directs its attention, not merely to the fossils themselves, but also to the strata in which they lie; and it is one of the most curious and striking facts which geology discloses, that every stratum has its peculiar characteristic group of fossils, and this fact becomes frequently of great importance to the miner, by enabling him to distinguish between strata whose mineralogical characters appear precisely the same, but which may be separated by an immense interval, with regard to their geological position.

"As one of the principal objects of this society is to enable the miner to avail himself of the assistance of scientific knowledge, wherever science and practice can be brought to bear upon one another, your committee have considered this arrangement decidedly the best. Of the soundness of this opinion, they think, indeed, the museum contains an admirable illustration, in a few specimens brought from the unsuccessful sinkings for coal at Northampton, amongst which may be seen the gryphite, the belemnite, and other fossils of the lias, the presence of which alone would at once have shown any one possessed of the most superficial knowledge of fossil geology, the folly of spending money in so fruitless a search.

"Before concluding this brief notice of the contents of your museum, your committee cannot avoid remarking, that the very existence of such a collection furnishes this society with a most encouraging proof of the rapid progress of this branch of geology, and, at the same time, calls upon them for new and active exertions. When it is remembered that little more than two years has elapsed since the death of the much-lamented Mr. Smith, who has often been termed the father of English geology, and who certainly laid the foundation of our knowledge, with regard to the fossil contents of our rocks, the progress which has been made in this study must strike every one with some surprise. But if so much has been effected in so short a period, with means so limited compared to those we now possess, what may not be expected for the future, with the advantages, and the stimulus for exertion as well, which such societies as these present? Nor need we for a moment imagine that there is any fear of this department being exhausted—the more observers the more shall we discover of its hidden stores—for the region opened to us is indeed almost unexplored, and one to which we are but just beginning to find the key. To the fossil contents of the rocks peculiar to this district, your committee think it desirable that the main exertions of your curators should be devoted; but, at the same time, this will not be the sole object of their attention; they hope, indeed, that many valuable specimens, from other and distant formations, will be procured, by the exchange of duplicates. They would also recommend the formation of a complete mineralogical series of the British rocks, especially of those which are of importance in the leading manufactures of the country; and, with a view to this, they would propose that a communication should be opened with the secretaries of the Museum of Economic Geology, now forming under the direct patronage of Government.

"To the formation of a first-rate library, your committee would also direct your attention. This should be considered as one of the most important objects to be effected, for without this it will be impossible to avoid yourselves the fatality of the experience or the labours of others; you will often tread the ground which has been trodden before, and find, after much toil, that you have been labouring to arrive at truths already well known, or perhaps have the mortification of embracing, as true, erroneous opinions, which a subsequent acquaintance with observations already made will compel you to abandon. Besides, all geological formations bear some relation, more or less, to each other, and the study of this science will be found to present fewer difficulties, and to become more and more fraught with interest, as we avail ourselves of researches into the character and contents of other formations, in order to explain and illustrate our own.

"But it is not to the museum and library, important as they are, that your sole attention must be directed. There are many points of great interest, unconnected with fossil remains, bearing upon the structure of the earth—upon the changes its surface has undergone—and the enormous periods which have elapsed during the deposition of the deposits which compose its crust. The mining operations carried on so extensively around us furnish admirable opportunities for the elucidation of these and many other interesting problems, especially of those connected with the protrusion of the various beds and hills of trap rock, which so intersect and interfere with our coal-field. The phenomena attendant on these magnificent instances of the extraordinary volcanic forces which at different periods have been in existence

around us, will alone furnish an inexhaustible source of investigation, of a most interesting character. With a view to these objects, your committee would suggest the construction of complete and detailed geological maps, showing the outcrops of the different coal and limestone rocks—the dip of the strata—the bearing of the different faults which intersect the coal-field, and divide it into so many distinct sections, especially of those which form the boundary of the coal-field, as at present known, and which bring the new red sandstone into immediate contact with the coal measures—the connection of these faults with the elevation of the various limestone and basaltic hills—and the points in this district where the volcanic rocks are present. Mr. H. Beckett, of Wolverhampton, and Mr. J. O. Birettell, of Dudley, have kindly promised to furnish surveys, upon a large scale, of many of the parishes of this district, and, with the valuable assistance of the ground bailiffs connected with the various mining works in the neighbourhood, your committee hope that much may be effected towards this desirable object.

"Having thus briefly alluded to a few of the leading features of the museum, and glanced at some of the objects which they think it desirable this society should endeavour to effect, your committee would remark, that geology is essentially a science of observation. To the recognition of this fact is indeed to be attributed, in a great degree, the rapid progress it has made within the last few years; but rapid as this progress has been, the army of observers engaged in its study through every quarter of the globe, so far from having exhausted any one department of this science, have only served, as it were, to extend the field of view, and to raise us just to that elevation from whence we may discern what a rich and fertile district, and what boundless prospects, are opening out beyond. Your committee hope, indeed, that this society will ever keep in view the necessity of accumulating facts, of registering minutely every observation and every new discovery; for while they acknowledge that many of the most important discoveries of geologists, and some which are the most startling to those entirely unacquainted with the science, seem indeed to follow clearly from facts already known and undisputed, they think it probable that this science would have made yet more rapid strides, had geologists exhibited somewhat more caution in their theories, until their data had been more extensive, and gathered too from more distant and more numerous points of view. Content, to some degree, with the more humble office of observers and collectors of facts, this society should show that, truly desirous of being real promoters of science, they can labour, as pioneers, in hewing out the raw material, and in laying a broad and wide foundation, whereon those who follow in their steps, by the aid of the experience and information thus placed before them, may rear a superstructure permanent and enduring."

COMPRESSED AIR APPARATUS.

FOR SINKING THE SHAFTS OF MINES, AND FOR CARRYING ON OTHER WORKS UNDER WATER, AND IN SANDS COVERED BY THE SEA.

[Continued from page 56.]

"The principle of the apparatus was correct, and there could be no doubt as to the certainty of its results. One thing, however, remained to be proved, whether it was possible to live under a pressure of from three to four atmospheres. Having consulted, on this point, M. de Las Cases, with whom I was associated in the execution of the works, it was decided that we would not submit the workmen to the action of the compressed air until we were well assured of its effects upon ourselves. We accordingly repaired to a physician in Paris who was in the habit of resorting to similar experiments for the cure of certain diseases, and we found in his possession an apparatus like that of M. Tabarié, of Montpelier, in which, eight months previously, M. de Las Cases had supported a pressure of three-quarters atmosphere above the ordinary atmospheric pressure. The apparatus in which we were about to make this fresh experiment had a common air manometer, and could hardly support a pressure of two atmospheres. The numerous escapes which resulted from its imperfect construction did not permit the mercury to rise more than twenty-two inches, although our experiments lasted nearly two hours. We only sustained, therefore, during the first trial, a pressure of one atmosphere and three-quarters; and our object of ascertaining the effect of compressed air at a pressure of at least three atmospheres was not attained. Having requested some repairs to be made in the apparatus, we next day recommenced our experiments; but the better to superintend the operation, M. de Las Cases remained outside, to be more certain of the exact pressure to which one of his relatives and I were about to be submitted. The apparatus had been in action about three-quarters of an hour, and the mercury had hardly risen to the height of forty inches in the manometer, when suddenly a detonation, which can only be compared to that of a four-pounder, was heard, and at the same moment my companion and myself were seized with a chilliness like that of ice, and plunged into complete darkness, in consequence of the instantaneous appearance of a thick fog. One of the glasses of the apparatus had burst. I learned from M. de Las Cases that the glass, which was six lines of the metre in thickness, and about six inches in diameter, and which served to light the interior of the apparatus, had been smashed in a thousand pieces, that the fragments had been expelled with great force, and had passed close to him, after having riddled with holes a large curtain which protected the machine from the rays of the sun. Several persons, attracted by the noise of the explosion, hastened to gather up the pieces of glass, which had been scattered about to the distance of 100 metres, and one of them, to our great astonishment, picked up a piece of felt, which was found to have been torn from my hat. The explosion and bursting of the apparatus, for which we were in no wise prepared by the first experiment, had, however, no other result than to occasion us a surprise. Our experiment was again a failure, for we were far from three atmospheres. Tired out not only by these mishaps, but others which it would be useless to relate here, I no longer thought of making experiments with any other than my own apparatus.

"I have already stated that the steam-engine at our disposal had never before been appropriated to anything like the use which I now proposed to make of it. To render my description complete I ought also to say a few words of our compressing pumps, the preparation of which presented great difficulties, and, for a long time, delayed the progress of the operation.

"It will, doubtless, be said, that compressing pumps are no novelty, and that they are used for the manufacture of gaseous waters, for the bellows of blast-furnaces, &c. I am, nevertheless, answer, that I have experienced the greatest difficulty in obtaining good compressing pumps, although I employed in their construction the most skilful mechanicians in Paris. I required a large body of air at a high pressure, and pumps adapted to a continued work of several months. These were indispensable conditions, and I was unable to obtain them from the pumps with copper valves, which I at first ordered to be made. When it is only required to raise water, the latter description of pump is as good as any that can be made use of, but they are wrong who suppose that the same results can be obtained from it in the compression of air. In fact, water is an incompressible body, whilst air is essentially elastic. When it is necessary to raise water, the result of its incompressibility is, that as soon as the piston exercises its pressure on the liquid, all its power is, at the same instant, conveyed to the valves through the medium of the liquid. Hence the power is properly exercised, and the most successful results are the consequence. When, on the contrary, it becomes necessary to compress air by means of these pumps, the action is very different.

"If the working of the engine be active, and if the valves have a certain weight, which is indispensable in strong pumps, it follows that the piston, which at first experiences very little resistance from the elasticity of the air, takes instantaneously a very great speed, whilst the valve, on the contrary, in consequence of its weight, presents an inert force, which is not overcome until the air has been compressed much above the required pressure. The results of this will be repeated shocks, the destruction of the valves, and, finally, a bad machine, especially when a continued action is required. Such were the serious inconveniences which, for a long time, retarded the progress of our operations, and which finally led me to consider of a more perfect description of valve for the condensing pump.

"My improvement consists simply in replacing the copper by leathern valves. These valves, being much lighter and simpler, have none of the inconveniences alluded to above, the idea being derived from the ordinary bellows, which I imitated as nearly as possible in the preparation of the new pumps, from which I have obtained such advantageous results. These pumps consist of a cylinder, which rests on a cast metal plate, pierced with two rows of holes. These holes are arranged like those in the ordinary description of bellows, and are covered by leather valves, fastened by stays, which are made of the same material. The exhausting valve is placed in the interior of the cylinder, whilst the other is fixed outside, on the cast metal plate. The piston of the pump being full, it should be kept constantly covered with water, to facilitate the movement. I should add, that experience has proved to me, that water produces a better effect than oil in cases like this. Such was the improvement which I effected in my air-pumps to avoid the inconveniences noticed above, and from the period of their construction they have continued working night and day for entire months without requiring the least repair. There now remains nothing but to describe the effect produced on the workmen by the compressed air, and the results obtained by means of the apparatus.

"The first phenomenon observed on passing from the free to the compressed air was a pain, more or less acute, which affected the ears. This pain commenced with the first stroke of the piston, and usually ceased when the mercury rose some inches in the manometer—that is to say, it ceased as soon as an equilibrium of pressure was established between the compressed air of the apparatus and the air contained in the interior of the ear—a fact the more probable from our discovering that the best means of causing it to disappear, was the swallowing of our saliva, and the effecting a movement like deglutition. It is remarkable that the pain, though hardly perceptible to some persons, was insupportable to others. By some even (though the instances were extremely rare) it was scarcely felt on entering the compressed air, whilst on quitting it it became very severe. I ought to mention, in addition, that the state of the body at the time contributes more or less to the effect, for I have myself experienced, and I have often remarked it with others, that only a slight numbness in the limbs will be one day perceptible, whilst on the next (all the circumstances of the experiment appearing the same) the pain becomes intolerable. We constantly observed that this numbness manifested itself, more or less, in proportion to the size of the apparatus, and to the time consumed in passing from the free into the compressed air, or *vice versâ*; and the workmen have always felt it whenever they had occasion to pass from the air chamber into the shaft. The second phenomenon produced by the compressed air is a visible acceleration of combustion, according to the intensity of the compression. At the pressure of three atmospheres, this acceleration increased to such an extent that we were obliged to substitute thread for cotton wicks in the candles that were used. The latter burned with such rapidity, that they hardly lasted a quarter of an hour, and they created besides an intolerable smoke. By means of thread wicks, the combustion and smoke were considerably diminished. This acceleration of combustion is easily explained by the fact of an undue proportion of oxygen being contained in the same compass.

"As to the temperature of the shaft, we found that it raised between fifteen and seventeen degrees centigrade, when full of compressed air at three atmospheres. It was also observed that, at the pressure of three atmospheres, the pumps, in place of injecting cold air, injected air which was nearly the above temperature (fifteen to seventeen degrees centig.), and which necessarily became much cooled before arriving in the shaft; for I assured myself that the pipes near the pumps maintained constantly during their working seventy or seventy-five degrees centig. Another remarkable circumstance also manifested itself—viz., the intense cold produced by the distension of the compressed air. At the moment that the stop-cock was opened to establish a communication with the atmospheric air, a species of cloud or fog formed in the apparatus, and became thicker in proportion to the rapidity with which the air became distended. A chilliness immediately seized us, and we soon found ourselves in the midst of a fog, which differed in no respect from the densest fogs of the autumn season, not even in the argillaceous smell which is peculiar to them. This odour was very perceptible, and struck M. de Las Cases and myself very forcibly when we first submitted ourselves to the action of compressed air. It is easy to augment at will the intensity of this fog, or to make it wholly disappear, by opening or shutting the stop-cock. The phenomenon, in my opinion, affords the most satisfactory explanation of the cause of fogs, the peculiar smell of which can be produced artificially, and in all their disagreeable effects, by these means."

[To be continued.]

PROPERTIES OF HOT AND COLD-BLAST CAST-IRON.

The principal ore of iron smelted in Britain is the clay ironstone of the coal measures. This is always a carbonate of iron (composed of oxide of iron and carbonic acid), but it is never absolutely pure, and it varies in this respect considerably even in specimens from the same bed. The mean richness of the ore in the principal fields may be taken at about 33 per cent. of metal, but the rich Welsh ore sometimes contains as much as 89 per cent. of carbonate, or 42 of metal; and the richer beds of Dudley and of Lanarkshire yield as much as 82 per cent. of carbonate, or 40 of metal. The extraneous matters with which the carbonate is usually associated are, lime, magnesia, silica, and alumina, with commonly a little manganese. These matters are exceedingly variable in quantity; sometimes the silica and alumina together constitute 45 per cent. of the ore; at other times they are entirely wanting: and the lime and magnesia are equally inconstant. The presence of these foreign matters in the ore from which our cast-iron is obtained explains why that substance has always associated with it some impurity or other. The method by which the ore is smelted will render this obvious.

The ore, before it is put into the furnace, is broken into moderately-sized pieces and roasted—that is, baked by a method very similar to the burning of bricks in clumps. This process drives off the carbonic acid from the carbonate of iron, and reduces the weight of the ore from 25 to 30 per cent. It is now ready to be placed in the smelting-furnace, which is a hollow brick building, in the form of a tower, from forty to fifty feet high. The roasted ore is mixed, in the furnace, with limestone (any carbonate of lime) and with coke, if the cold-blast is to be employed in the smelting process; or simply with common coal, if the hot-blast is to be employed. The use of the limestone is to act as a flux upon the earths in connection with the ore, upon the well-known principle that it melts with the clay into a liquid glass when sufficiently heated; and, by doing so in the operation of smelting, it removes the argillaceous matter from the ore, and allows the oxide of iron to come into contact with the ignited coals, which reduce it to the metallic state by withdrawing its oxygen. The fire is urged to intensity during the operation, by forcing into it a current of air, either at the ordinary temperature, or heated up by appropriate apparatus to about 612°; it thus constitutes, according to the temperature at which it is employed, the cold or the hot-blast. The vitrified materials rise and float upon the surface of the melted mass, and are termed *scoria*, or *slag*; and the melted metal is run off at an opening at the bottom of the furnace, and is conveyed into sand moulds laid upon the ground, or simply into furrows made in sand. The large mass which sets in the main furrow is called, by the workmen, a *sow*, and the lesser ones are *pigs*—and hence this sort of iron is generally known by the name of *pig*, or *crude*, iron.

It was, till lately, the general opinion that the difference between cast-iron and malleable-iron consisted solely in the presence of carbon (charcoal), in the former; or, in other words, that cast-iron was simply what chemists call a carburet of iron, and that its different degrees of hardness depended entirely on the difference in the degrees of its carbonization. Thus, the iron known to founders as No. 1, and which is the softest under the file and chisel, and possesses but a moderate tenacity, was considered to possess an excess of carbon. By remelting this, it passes into No. 2, which is lighter in the shade than No. 1, is more tenacious, is easily turned and polished, and makes the finest castings; this modification of quality was attributed solely to the loss of carbon in the process of remelting. Again, by repeated melting, No. 2 passes into No. 3, called white cast iron; this is possessed of less fluidity, is hard and brittle, and makes very rough castings—properties attributed to the yet less admixture of carbon.

There is no doubt that the opinion concerning the degrees of carbonization, and the results attributed to that cause, are in the main correct; but there are other ingredients which enter into the composition of cast-iron, and seem to modify its qualities almost as much as the varying admixture of carbon itself. Thus, Dr. Thomson has shown that manganese, silicon, and aluminum (the bases of silica and alumina) are united with carbon in the composition of all cast-iron; and that sulphur, calcium, and magnesium (the bases of lime and magnesia) are sometimes present; and I may add, that arsenic, copper, sulphur, and several other impurities, are not often entirely absent. These all affect the quality of the iron in proportion to their quantities, which are variable, and particularly so according as the iron is manufactured by the cold or hot-blast.

Overlooking the immediate matters, sulphur, calcium, magnesium, &c., the constant constituents of cold-blast cast-iron is stated by Dr. Thomson, in the *Seventh Report of the British Association*, as follows:—

Iron	93·564, that is,	27·21	= 6¾
Manganese	0·271 "	0·249	
Carbon	2·069 "	2·79	= 1
Silicon	1·066 "	1·066	
Aluminum	0·432 "	0·337	

that is, 6¾ atoms of iron and manganese to 1 atom of carbon, silicon, and aluminum; and here the carbon, silicon, and aluminum are very nearly in the proportions of 19, 5, and 2, instead of 4, 1, 1, as found in the cold-blast cast-iron. The mean specific gravity of all the specimens analyzed was 7·063, whereas that of cold-blast iron is 6·703.

From this, then, it appears that iron smelted by the hot-blast has its specific gravity increased by about the 23d part, and that it contains a greater amount of pure iron, in the proportion of 13 to 7.

	Iron.	Carbon, &c.
For cold-blast cast-iron, No. 1, has 3½ atoms	.....	1 atom.
For hot-blast ditto No. 1, has 6¾ "	.....	1 "

Hot-blast iron is, therefore, purer than cold-blast iron.

Immediately on hot-blast cast-iron being brought into use, it was observed that there was a difference in its mechanical properties when compared with iron manufactured by the cold-blast; and the current opinion was, that smelting by the hot-blast detracted from the strength of the iron. Numerous and elaborate sets of experiments, undertaken by Messrs. Hodgkinson and Fairbairn, of Manchester, at the request of the British Association, lead in general to an opposite conclusion. The following table contains a general summary of the results obtained by Mr. Hodgkinson in respect to the direct strength of the irons prepared by the two modes as regards compression and extension. The second column shows the force in pounds which is necessary to crush a cylinder whose transverse section is a square inch; the third column gives the force in pounds which is required to tear asunder such a cylinder; and the ratios of these forces are shown in the fourth column:—

Description of metal.	Compres. force.	Tensile force.	Ratio.
Devon iron—No. 3, hot-blast	145,435	21,907	6·638 to 1
Buffery iron—No. 1, hot-blast	86,397	13,434	6·431 to 1
Ditto —No. 1, cold-blast	93,385	17,466	5·346 to 1
Coed-Talon iron—No. 2, hot-blast	89,734	16,676	4·961 to 1
Ditto —No. 2, cold-blast	81,770	18,955	4·337 to 1
Carron iron—No. 3, hot-blast	108,540	13,503	8·037 to 1
Ditto —No. 2, cold-blast	106,375	16,683	6·376 to 1
Carron iron—No. 3, hot-blast	133,440	17,755	7·513 to 1
Ditto —No. 3, cold-blast	118,442	14,200	8·129 to 1

From this table it appears that the resistance of cast-iron to rupture by extension varies from six to nine tons upon the square inch, while its resistance to rupture by compression varies from thirty-six to sixty-five tons. It further appears, that the absolute strength of some irons, both as regards their tenacity and their power of resisting compression, is considerably increased by the hot-blast. This remark, indeed, applies to all the specimens named in the table, except the Buffery, No. 1. The greater strength of the hot-blast iron of Carron over the cold-blast iron of the same works, is particularly remarkable; the additional power of No. 3 to resist compression is no less than eight tons on the square inch, and its tenacity is augmented by one and a half tons on the same sectional surface.

It would, however, be hasty to conclude at once, from this table, that the hot-blast irons are superior, in every respect, to those manufactured by the cold-blast. The following table, exhibiting a general summary of the experiments upon the transverse strength of the two sorts of iron, present some modifying considerations:—

Description of metal.	Ratio of strength.*	Ratio of powers.†
Carron iron—No. 2	1000 : 990	1000 : 1005
Devon iron—No. 3	1000 : 1417	1000 : 2786
Buffery iron—No. 2	1000 : 931	1000 : 962
Coed-Talon iron—No. 2	1000 : 1007	1000 : 1234
Ditto ditto —No. 3	1000 : 977	1000 : 995
Elsicar and Milton iron—No.	1000 : 818	1000 : 875
Carron iron—No. 3	1000 : 1161	1000 : 1301
Muirkirk iron—No. 1	1000 : 957	1000 : 983
Mean	1000 : 1025	1000 : 1226

* Ratio of strength, that of the cold-blast being represented by 1000.

† Ratio of powers to sustain impact, that of the cold-blast being represented by 1000.

This table, then, shows that the strength of hot-blast iron to resist transverse strain is greater than that of cold-blast iron in the ratio of 1025 to 1000, and that its strength to resist impact is greater in the proportion of 1226 to 1000; but it will be observed, that the extraordinary difference of the Devon, No. 3, iron, in a great measure accounts for the difference in strengths, as shown in the mean results.

Mr. Fairbairn has also instituted a series of experiments on the effects of permanent weights in deflecting bars of the two sorts of iron. Five bars of cold and five of hot-blast Coed-Talon, No. 2, iron, one inch square, were selected, and loaded with different weights, the ends being supported on props, four and a half feet asunder, and left in this position, to determine how long they would sustain the loads without breaking. The ultimatum of the experiments may be far distant, Mr. Fairbairn remarks, that, if we may judge from the hardihood displayed by the bars in resisting the load, there is every probability of the experiment outliving the experimenter; but, at the end of fifteen months from the institution of the experiment, he was able to state the mean increase of deflection of the bars at $\frac{1}{100}$ inch for the cold-blast, and $\frac{1}{144}$ inch for the hot-blast, giving the ratio of 1000 to 1045.

Mr. Fairbairn, in his report, remarks, that there cannot be a doubt of the force of cohesion being strongly developed in these experiments. The minute crystalline particles of the bars are acted upon by loads which, in the heavier weights (448 lbs.), are almost sufficient to produce fracture; yet fracture (except in one instance) has not been produced, and to what extent the power of resistance may yet be carried, is left for time to determine. It, nevertheless appears, from the present state of the bars (which indicate a slow, but progressive, increase of deflections), that we must at some period arrive at a point beyond their bearing powers; or otherwise to that position which indicates a correct adjustment of the particles in equilibrium with the load. Which of these two points we have, in this instance, attained, is difficult to determine; sufficient data are, however, attained to show that the weights are considerably beyond the elastic limit,* and that cast-iron will support loads to a much greater extent than what has usually been considered safe, or beyond that point where a permanent set takes place. But, in whatever way this may be determined, it is obvious that these experiments give greater indications of strength than has generally been supposed cast-iron would do; and should the bars continue to support the loads for a few years longer, there cannot exist a doubt as to the security of this metal under applications hitherto unknown; and the same may be said of other materials.

It was also found, as might be expected, that temperature exercises a considerable influence on the strength of cast-iron. The mean of the experiments on this point gave as the strength of

Cold-blast iron at 32° and at 120°	in the ratio of	974	to 743.
Hot-blast iron at 32° and at 120°	ditto	911	to 731,

being a diminution in strength as 100 to 83 for the cold-blast, and as 100 to 80 for the hot-blast, or 17 per cent. loss of strength in the cold-blast, and 19 per cent. in the hot-blast.

[To be concluded in our next.]

* The elastic limit is that point where bodies under strain lose the power to recover themselves when the load is removed—a property which is strongly exemplified in cast-iron. It has been ascertained by many, that materials cannot be loaded with safety beyond that point.

GOLD-DUST.—The St. Petersburgh papers state that an important discovery has been made by the expedition sent by the Government in search of deposits of sand containing gold. It consists of a bed of sand, near the source of the Nadejnal, and far from the working station called Peauskoi Tarvinski; it is estimated to contain 100,000 lbs. of sand, and, to produce 3 pounds 9 pounds 16 zols of gold. In the essays already made 4 pounds 60 zols of metal, rich in quality, have been extracted. The pood is rather more than 40 lbs. English.

DILATATION OF GAS.—At the Paris Academy of Sciences, on the 24th ult., M. Pelouze read a report on a memoir (communicated some weeks ago to the Academy of Sciences at Berlin, by M. Magnus) on the experiments of M. Guy Lussac and M. Rudberg to ascertain the dilatation of gas. M. Guy Lussac had arrived at the conclusion, that what is called "the arithmetical co-efficient" of the number expressing the rate of dilatation should be expressed by the decimal number 0·0375; this was on the supposition that the volume of gas was measured under a constant pressure; but M. Rudberg had found the same co-efficient at 0·03546, by measuring the gas under a variable pressure. M. Magnus had taken the trouble to repeat these experiments, and had arrived at results much nearer those of M. Rudberg than those of M. Guy Lussac; this he attributed to a defect in mercury, as being unfit for exactly closing the apertures and joints of the vessels receiving the gas, notwithstanding that the use of mercury for these experiments was recommended by M. Biot in his *Traité de Physique*. M. Magnus had experimented on different gases and gaseous fluids, and had found the following co-efficients of dilatability:—viz., air, 0·03665; hydrogen, 0·03656; carbonic acid, 0·0369; and sulphuric acid, 0·03846. It would appear doubtful whether the dilatability of gas remains always constant, and whether it may not be under various pressures.

NEW PATENTS FOR JANUARY.

E. Hall, civil engineer, Dartford, *for* an improved steam-boiler.

S. H. Le Petit, St. Pancras-place, Middlesex, for improvements in the manufacture and supply of gas—being a communication.

J. T. Jeffree, engineer, Blackwall, for certain improvements in lifting and forcing water and other fluids, parts of which improvements are applicable to steam-engines.

J. Tone, gentleman, Newcastle-upon-Tyne, for improvements in smelting copper ores.

C. W. Williams, gentleman, Liverpool, for certain improvements in the construction of furnaces, and effecting combustion of the inflammable gases from coal.

J. Barnes, manufacturing chemist, Church, near Accrington, Lancashire, for certain improvements in the working of steam-engines.

A. Kurtz, manufacturing chemist, Liverpool, for certain improvements in the manufacture of artificial fuel.

G. Boccius, gentleman, New-road, Shepherd's bush, for certain improvements in gas, and on the methods in use, or burners for the combustion of gas.

W. and J. Galloway and J. Hally, engineers, Manchester, for certain improvements in machinery for cutting, punching, and compressing metals.

P. Journet, engineer, Dean-street, Soho, for improvement in steam-engines.

SPECIFICATIONS OF RECENT PATENTS.

IMPROVED REVERBERATORY SMELTING FURNACE.

John White Welch, merchant, Austinfriars, for an improved reverberatory-furnace to be used in the smelting of copper ore, or other ores which are or may be smelted in reverberatory-furnaces, January 21.—This furnace has two chimneys or flues, leading away in opposite directions from the circular basin or body of the furnace to two upright chimney-stacks, by means of which the requisite draught is obtained. A rapid current of flame, heated smoke, gas, and air, proceeds from the fire in a fire-place situated on one side of the furnace, over a low wall, called the fire-bridge, into the body of the furnace, at the part thereof, and, striking against the arched dome, is deflected or reverberated downwards upon the ores, or other matters lying on the floor of the furnace, and being divided into two currents, passes away to the chimneys. The heated gases, *&c.*, are deflected down upon any ores, *&c.*, which may be placed in the passages, which slope downwards towards the body of the furnace. The ores are fed into these passages from hoppers placed above, and as they become roasted or calcined, are pushed down into the main body of the furnace, by means of iron rabbles introduced through suitable openings made for that purpose. Furnaces thus constructed are said to be applicable to the calcining or melting of copper or other ores, previously prepared and mixed in the usual manner. The claim is to the improved reverberatory-furnace before described; the novelty and the chief distinction between such improved furnace and those in common use, being that the current of flame, heated smoke, gas, and air, which proceeds, in the usual manner of ordinary reverberatory furnaces, from the fire-place and over the fire-bridge into the body of the furnace (instead of proceeding onward away from that body by one flue or passage to the chimney, as is the case in ordinary furnaces), in the improved reverberatory-furnace divided into two separate currents, which pass away laterally from the body of the furnace in opposite directions, in order to go by two distinct flues or passages to the chimneys; in each of which flues or passages part of the ore (regulus or imperfect metal) which is to be operated upon may be placed, so as to receive a heating action from the divided currents of flame, heated smoke, air, and gas, passing through each of the said passages respectively; so that two flues or passages, both having ore in them, are heated by the same fire, and with an economy of fuel. The improved reverberatory-furnace may have two distinct vertical chimneys; or the said two vertical chimneys may be brought together into one vertical stack or chimney, by means of suitable flues or passages extending from the lowest part of the two vertical chimneys, to lead into the lower part of the said one stack or chimney, if that mode is preferred.

IMPROVED MEANS OF PRODUCING HEAT FROM THE COMBUSTION OF CERTAIN KINDS OF FUEL.

James Colley March, surgeon, Barnstaple, Devonshire, for certain improved means of producing heat from the combustion of certain kinds of fuel, Dec. 8.—This invention consists in a mode of facilitating or obtaining the combustion of the various descriptions of coal (with the exception of anthracite) by causing streams of air to impinge on the upper surface of the fuel, without passing through the general body of the coal below the ignited surface, and in carrying out the invention, no fire-bars are used in the furnaces. It is applied to the furnace of a stationary steam-boiler in the following manner:—Beneath the boiler is a receptacle for coals, called the coal-chest, the coals contained in it resting on a moveable plate or piston, which is raised by racks and pinions as the upper part of the coal is consumed. In the front of the boiler a main pipe enters, conveying a blast of air into five horizontal tubes within the boiler, from each of which five vertical tubes descend into the furnace, and the air, passing through these tubes, is caused to impinge on the upper surface of the ignited fuel.

IMPROVEMENTS IN THE MANUFACTURE OF RAILWAY WHEELS.

William Losh, Esq., Little Benton, Northumberland, for improvements in the manufacture of railway wheels, December 24.—This invention relates to the application of wood, rope, felt, or other like flexible and yielding material, between the iron tayere and the ring or bearing produced by the projections of the bars of iron employed to make the wrought-iron spokes, with or without the intervention of a ring of malleable iron between such bearings and such flexible or yielding materials, by which means wrought-iron railway wheels will be less liable to be prejudicially acted on by the vibrations to which such wheels are liable when in use than if they were composed of iron alone. In the first place the spokes and felloes are produced by bending bars of iron in such a manner that the two ends of each bar being made fast in the nave, will produce two spokes, the middle portion producing a part of the ring or felloe. The bar of iron constituting the spokes, and a part of the felloe is bent at the point, angles, or curves, so as to produce nearly a ring or concentric bearing, yet the bending of the curves, angles, or points may vary, provided there are sufficient portions of a complete or concentric ring produced to give the requisite support to the railway tayere when applied to the wheel, or in place of making the spokes out of a single bar of iron the parts of the spokes may be welded to a suitable portion of the felloe. In the next place there is a ring of wood composed of one or more pieces, the railway tayere is then fastened by rivets to the ring of wood and the felloe of the wheel. In order to facilitate the getting on of the tayere and to retain the wood correctly in its place while doing so, the inventor drives on a light iron hoop on one side of the wheel a short distance so as to hold the wood together, and then on the other side drives on the railway tayere, which will force off the previous hoop. In order to get the tayere on easily it should be heated so as to expand the ring. There is another arrangement of wheel which is so constructed as to apply rope between the felloes or ring (this is produced by the bending and continuation of the bars constituting the spokes) and the railway tayere. In this wheel the felloe is composed of certain parts which are continuations of parts constituting the spokes, it will therefore be seen that in this case those parts of the felloe have only one spoke each continued therewith, either by its being a piece of the same bar of iron or welded thereto. There is a ring of rope affixed to the railway tayere by rivets, and when they are sufficiently compressed they are placed between an inner and outer rim of iron, and when thus placed they are fixed around the felloes or bearings, proceeding from the curved prolongations of the bars of iron beyond the bends of the points, angles, or curves, at the outer ends of the spokes by shrinking on the tayere in the usual way.

The inventor claims as his invention the mode of constructing railway wheels by applying wood, rope, felt, or other flexible and yielding materials, between a hoop or railway tayere, and the rings, felloes, or bearings produced by certain parts which are continuations of the spokes.

IMPROVEMENTS IN THE MANUFACTURE AND CONSUMPTION OF FUEL.

Henry Heatley Mahon, M.D., Regent's-park, for his invention of improvements in the composition and manufacture of fuel, and in furnaces for the consumption of such and other fuel.—There are three features of novelty proposed under this patent; firstly, the composition of an artificial fuel; secondly, the machinery by which this fuel is compounded and made into cakes, suitable for stowage and use; and thirdly, some peculiarities in the construction of the furnace of a boiler, in which the improved fuel is to be consumed. The materials to be compounded for manufacturing the fuel, are peat moss or moss earth, clay, earthy silica, mineral deposit, coke, animal matters, such as cartilaginous, and green vegetables. These are to be mixed with pitch, asphaltic, bituminous, resin, or naphtha, and also bark or granted wood, and the shells of any kinds of fruit. These substances, or such of them as are employed, are to be first reduced to powder by the most convenient means, and then mixed together in a pug mill, as usually employed by brick-makers for mixing their clay and breeze. After this, the materials are to be moulded into bricks or blocks by machinery, similar to that employed for moulding bricks, several constructions of which are shown by drawings, but not claimed as possessing any novelty, except in its application to the mixing and moulding of the fuel. The improved construction of furnace for burning this composition fuel, or any other kind of fuel, is shown in several figures, in connection with a steam boiler, and is stated to be formed upon more correct philosophical principles than any hitherto known. The only feature of novelty, however, proposed, in the peculiar shape of the passage, by which atmospheric air is supplied to the furnace. The cold air enters by openings below in front of the brick-work, and proceeds up passages, formed at the sides and back of the furnace, and thence down similar passages, parallel to the former, in contact with the furnace; and ultimately into a close ash-pit. In this contorted course, the air becomes rarefied by abstracting heat from the furnace, and so passes through the fire-grate, in a rapid current, and heated state, to support the combustion.

AMERICAN PATENTS.

[From the *Journal of the Franklin Institute.*]

IMPROVED METHOD OF SUPPLYING STEAM-BOILERS.

Benjamin M. Hyatt, Wilmington, Delaware, for improvements in the mode of supplying steam-boilers, October 10.—A cylinder is placed above the boiler, with one pipe leading from the bottom thereof nearly to the bottom of the boiler, another from the upper part of said cylinder to the top of the boiler, and a third either to a cistern above, or a well below. All these pipes are provided with stop-cocks to be worked at proper intervals by the engine. When the third pipe connects the cylinder with a well below, the operation is as follows—viz., steam is admitted from the boiler to the cylinder through the first named pipe, and by its condensation forms a vacuum in the cylinder, which is to be filled with water from the well, by atmospheric pressure through the third pipe; steam is then again admitted through the first pipe, to make the pressure above the water in the cylinder equal to the pressure in the boiler, and the water is then admitted to the boiler through the second pipe. When the third pipe leads from the cylinder to a cistern above, instead of a well, steam is admitted into the cylinder only for the purpose of equalising the pressure. The patentee says—"I am aware that steam-boilers have been constructed with a supply cistern, in some respects like mine, that is with a chamber or cistern placed above them having tubes governed by stop-cocks connecting the top and bottom of the cistern with the boiler for the purpose of equalising the pressure of the steam upon the water and allowing it to descend into the boiler as herein described. I do not, therefore, claim the raising of water by the condensation of steam in a vessel for that purpose; but what I do claim is the combination for raising water and supplying a steam-boiler therewith, as herein set forth—that is to say, by the use of the pipes leading from the cylinder into the boiler, combined with the respective stop-cocks connected with the cylinder and the boiler, said cocks being operated by the stroke of the steam-engine in any convenient way, so as to allow the steam in the cistern at every stroke of the piston to come in contact with the tube leading to the well, so as to produce a rapid condensation, and a consequent vacuum, for the admission of water from the supply reservoir, or well. I also claim the combination and arrangement as above set forth for supplying water to the boiler from the cistern, or from any sufficient source above the boiler, the combination and the action of the respective cocks by the power of the engine being in all respects as herein set forth, with the exception of the apparatus for raising the water from a well or reservoir below the boiler. I wish to be understood, also, as not claiming in this the raising of water into a cistern connected with a steam-boiler by atmospheric pressure, steam being admitted from the boiler into the cistern and condensed as in my arrangement, unless the mode of supplying the boiler from the cistern, by balancing the pressure of the steam, be employed as herein described."

NEW MODE OF PROPULSION.

Mellen Battel, Albany, New York, for an improved mode of propelling boats on canals, October 14.—The improvement proposed is in the well-known mode of propelling canal boats by means of a wheel running on the bottom of the canal. The wheel is to be made with paddles in the usual way, and there are to be projections on the outer edges thereof to catch and hold on to the bottom of the canal, so that in shallow water the wheel may be employed to run on the bottom, and in deep water to act merely as a paddle-wheel. The wheel is placed between two boats, or between the sections of what is usually called a twin boat; it has its bearings in two vibrating balance beams, to which the engine is also attached, so that the wheel may accommodate itself to the inequalities of the bottom. The claim is to the "forming of the combined ground and paddle-wheel, so as to run upon the bottom of a canal and to propel the boat by the hold or friction of the cross bars and the rims alone, and when raised from the bottom to effect the propelling by the buckets, or paddles; said wheel being connected and combined with a vibrating frame within the body of the boat, which frame also sustains the steam cylinders in the manner set forth, and the respective parts concerned in the operation of propelling being arranged and operating substantially in the manner herein described."

IMPROVED SPARK ARRESTER.

Randall Fish, New York, for an improvement in the spark arrester for locomotive and other carriages, October 14.—In this spark arrester the usual chimney is surrounded by a drum divided into chambers by vertical partitions running from it to the inner periphery of the drum. The draught is conducted through a pipe into the first chamber, from this chamber into the next through a pipe in the partition, and so on until it has passed through all the chambers, from the last of which it is conducted back into the chimney through an opening near the top of the drum. The pipes that form the communications, from the chimney to the drum, and from chamber to chamber, are inclined downwards at an angle of about 45 degrees. The drum is provided with a receptacle at the bottom to receive the sparks. The claim, if given, would be merely a repetition of the foregoing arrangement, and we do not, therefore, insert it.

IMPROVEMENT IN RAILWAY CARRIAGE-WHEELS.

Albert Fuller, Providence, Rhode Island, for an improvement in the manner of making the wheels of railroad carriages, October 14.—In this wheel the rim is to be cast with a chilled flange, and the tread is sunk to receive a wrought iron tayere, which is put on while hot, so that the contraction of the metal as it cools will secure it in place; and it may be further secured by bolts. Claim.—"What I claim as my invention and desire to secure by letters patent is, placing the tayere in the sink in combination with the cast-iron chilled flange, for the purpose and in the manner described."

IMPROVEMENTS IN THE GENERATION OF STEAM.

Daniel L. Pickard, Hartland, Niagara county, New York, for a boiler for heating water for generating steam, October 14.—The furnace in this apparatus is placed within the boiler, which may be cylindrical, and the space between the furnace and the cylinder, at the sides and top, is occupied by alternate flues and water chambers, formed by means of convolute plates, so that the draught passes up over the top of the first water chamber, on each side, down between the first and second water chambers, and up between the second and third, and thence out at the chimney, which chimney passes through the outer water chamber. All the water chambers open into a water space at the end. Claim.—"Having thus fully described the manner in which I construct my boiler, what I claim therein as constituting my invention, and desire to secure by letters patent, is the manner in which I have combined and arranged the respective parts, consisting of the exterior case, the furnace, the convolute flues and water spaces, and the end water space, or bulk-head, as described."

IMPROVED STOVE FOR BURNING BITUMINOUS COAL.

William B. Lawrence, Cincinnati, Ohio, for an improved stove for burning bituminous coal, October 14.—The patentee remarks that "one of the principal causes of complaint in the operation of baking in cooking stoves is the result of the accumulation of soot and ashes in the flues, which being very bad conductors of heat prevent the heating of the oven plates, the air from the fire making its escape without communicating its heat where alone it is wanted; to obviate this difficulty is the main object of my improvement. "Said improvement consists, in the first place, in the forming of a scraper which may be cast in one piece, or which may be made by the uniting of several plates together so as to constitute one piece, and which, when in place, shall occupy the flue space above, below, and on each side of the oven, and shall have rods attached to it that pass through holes in one of the side plates of the stove, terminating in handles on the outside, in such manner as to admit of the moving of said scrapers back and forth within the flues, and simultaneously to remove the accumulated soot and ashes therefrom on every side. And secondly, for the purpose of discharging the soot which has been scraped off from the flues, I make perforations, or longitudinal openings, through the iron plate which forms the lower side of the bottom oven flue, and place under this plate a drawer, or other receptacle, into which the soot and ashes shall fall, and from which they can be readily removed whenever the same may become necessary." The claim is to the "manner of cleaning the flues surrounding the ovens of stoves of various kinds by the use of a scraper, vane or otherwise, made in one piece so as to surround the oven on four sides; and in combination therewith the respective openings in the bottom plate leading into the drawer, or receptacle, for the soot and ashes."

Novel Application of Zinc.—The *Hardy Mercury* notices a novel application of zinc at the Chevet Tunnel:—"At this tunnel, which is on the North Midland Railway, and about three miles from Wakefield, workmen are busily engaged lining the roof with zinc, which is the means of effectually preventing the continual dropping to which the tunnel was subject."

The Artesian Well at Grenelle.—A new tube is now making for the well of Grenelle in iron, of such a thickness that it will bear the pressure of fifty to sixty atmospheres. Experiments have been tried on two tubes placed one within the other, as the tubes were in the bore of the well, to ascertain what degree of pressure would be necessary to force them in; but though the hydraulic ram was employed, it required a pressure of from twelve to fifteen atmospheres to produce any effect on the tubes. The water still flows as copiously as ever, moderately warm, and altogether limpid and black as the waters of Paris.

WORK PERFORMED BY STEAM-ENGINES, IN DECEMBER, 1841.

Taken from the official duty paper of Mr. Thomas Lean, *of Marazion, Cornwall*: *s* stands for single; *d* for double; in. for inches.

Mines.	Engines.	Stroke in cylinder.	Load per sq. inch on pist.	No. of strokes p. minute.	Consumption of coal in bushels.	Pounds lifted 1 foot high by a bushel of coal.	Average quan. of water p. min.
		Feet.	Lbs.		94 lbs.		Im. gal.
W. Darlington	Eastern 80 in. *s*	10,0	12,0	9,6	——	——	945,0
Ditto ...	Haise's 60 in. *s*	10,0	12,0	7,66	2300	30,934,782	558,0
Gt. W. Fortune	G.W.Fort. 85 in. *s*	—	—	—	——	——	834,8
Ditto	Wh. Pros. 90 in. *s*	9,7	10,5	7,8	——	——	——
Ditto	T. Downs 70 in *s*	—	—	—	——	——	——
Ditto ..	Wh. Friends. 70 *s*	10,0	13,1	9,37	4313	44,532,781	797,2
Ditto	Owen V. 70 in. *s*	—	—	—	——	——	——
Ditto	Gwallon 36 in. *s*	—	—	—	——	——	——
Providence ..	30 in. *s*	6,0	14,88	5,3	849	24,902,686	97,6
Wheal Virgin	60 in. *s*	10,0	14,5	7,5	2314	48,227,694	434,8
Relistian	60 in. *s*	9,6	12,72	6,8	1656	32,214,888	250,3
Trevaskus....	60 in. *s*	—	—	—	——	——	——
Duffield ...	80 in. *s*	—	—	—	——	——	——
Carzise Cons.	70 in. *s*	10,0	9,86	10,0	3344	47,350,439	706,9
Wheal Julia..	80 in. *s*	—	—	—	——	——	——
Ding-dong ..	30 in. *s*	6,0	17,3	6,5	500	28,122,841	122,6
Levant	New 40 in. *s*	9,0	11,1	8,1	339	26,594,653	51,3
Botallack ...	30 in. *s*	6,3	10,6	5,1	184	28,177,019	42,0
Balleswidden	24 in. *s*	7,0	14,5	9,8	283	27,990,321	64,7
Godolphin ...	Sims's 80 in. *s*	10,0	11,19	10,1	3348	73,634,347	795,9
Great Work ..	W.Breage 60 in. *s*	9,0	8,5	6,1	1476	34,925,991	461,3
Ditto ...	Leed's 60 in. *s*	8,0	14,09	10,15	1936	69,806,335	
Wheal Vor ...	Borlase's 80 in. *s*	10,0	15,7	7,75	3442	73,333,023	1153,1
Ditto	Trelawny's 80in *s*	10,0	15,36	8,1	4316	61,445,173	
Ditto	Woolf's 53 in. *s*	9,0	16,0	9,05	2888	38,775,991	548,0
Ditto	Penhale 48 in. *s*	9,0	12,73	8,5	1494	48,927,291	447,5
Trewavas	45 in. *s*	9,0	19,0	7,3	3000	36,270,483	
Dunstanville	60 in. *s*	—	—	—	——	——	——
South Roskear	W.Chance 60 in. *s*	9,0	9,7	6,94	1670	39,393,163	163,2
North Roskear	New eng. 70 in. *s*	10,0	9,97	6,5	2014	33,546,755	317,2
E. Wh. Crofty	Trevenson 80in. *s*	10,33	10,08	6,48	2736	38,439,891	366,76
Ditto	Dudnance 36 in. *s*	8,0	13,9	—	——	——	——
Dolcoath	76 in. *s*	9,0	10,39	7,67	3744	37,333,175	264,01
Wheal Jewel .	90 in. *s*	8,5	15,9	7,5	1362	38,477,439	133,37
Poldice	Sims's 90 in. *s*	10,0	7,14	11,87	6096	39,589,948	943,77
W. U. Wood..	Williams' 80 in. *s*	10,0	16,0	9,3	3648	37,443,125	770,41
Hallenbeagle	Vice's 70 in. *s*	10,0	6,64	8,3	1530	65,162,663	1113,98
Ditto ...	Boscow. 66 in. *s*	10,0	11,27	7,64	3335	31,943,299	
W. Beauchamp	Western 26 in. *s*	7,75	—	—	1776	——	——
Ditto ..	Powning's 36 in. *s*	8,0	16,3	8,48	944	39,844,823	198,83
Wheal Uny ..	70 in. *s*	10,0	13,87	7,66	2975	67,366,379	438,11
Carn Brea	76 in. *s*	9,0	14,35	7,37	3204	50,892,212	765,61
Ditto ...	Sims, 50 in. c. c. *s*.	9,0	13,75	7,88	788	95,581,250	
Tincroft ...	86 in. *s*	9,33	15,39	8,7	2533	50,147,847	363,4
East Pool	60 in. *s*	9,75	7,6	7,6	1696	59,760,088	330,44
S. Wh. Basset	40 in. *s*	9,0	13,7	5,97	996	29,528,896	157,21
Consolidated	Taylor's 80 in. *s*	—	—	—	——	——	——
Ditto	Davey's 80 in. *s*	—	—	—	——	——	——
Ditto	Pearce's 63 in. *s*	—	—	—	——	——	——
Ditto	Woolf's 90 in. *s*	—	—	—	——	——	——
Ditto	Sawden's 90 in. *s*	—	—	—	——	——	——
Ditto	Job's 65 in. *s*	—	—	—	——	——	——
United Mines	Taylor's 85 in. *s*	11,0	11,4	7,3	2547	87,417,830	
Ditto	Cardozo's 90 in. *s*	9,0	13,5	7,79	3604	51,871,268	
Ditto	Elden's 80 in. *s*	9,0	16,0	9,33	878	70,628,499	2398,18
Ditto	Loam's 85 in. *s*	10,0	12,3	10,16	3134	38,464,982	
Ditto	Hocking's 80 in. *s*	10,0	16,0	8,24	4613	79,439,148	
Bissoe Bridge	50 in. *s*	10,0	7,33	7,17	978	47,396,699	383,23
S. Wh. Towan	70 in. *s*	10,0	9,5	7,5	2090	44,367,319	499,9
United Hills .	Williams' 60 in. *s*	10,0	8,55	6,9	——	——	646,9
Ditto	Old, 58 in. *s*	8,3	8,65	4,3	572	43,550,157	
Polberrow	60 in *s*	10,0	10,99	5,3	——	——	468,0
E. Wheal Rose	36 in *s*	8,0	15,48	8,8	1058	39,927,213	334,4
Charlestown U	50 in. *s*	9,5	12,2	8,3	1612	46,581,240	320,0
W. F. Consols	Union, 40 in. *s*	9,0	16,69	—	——	——	——
Fowey Consols	Austen's 80 in. *s*	10,33	13,57	7,8	2384	70,050,292	892,3
Polgooth	66 in. *s*	9,9	9,2	—	——	——	——

ENGINEERS' NAMES.

Wheal Darlington, Eustis; Trewavas, T. Tippet; Great Wheal Fortune, Grose; Providence Mine, J. West; Wheal Virgin, Grose; Relistian Mines, ——; Carzise Consols, Grose; Ding-Dong, Eustis; Levant, F. Michell; Botallack, J. Rowe; Balleswidden, Eustis; Godolphin, J. Sims; Great Work, Richards; Wheal Vor, Richards; South Roskear, J. West; North Roskear, J. West; East Wheal Crofty, James Sims; Dolcoath, Jeffree; Tincroft, J. West; Wh. Jewel, J. Sims; Poldice, J. Sims; Wheal Unity Wood, J. Sims; Wheal Beauchamp, Hocking and Loam; South Wheal Basset, Dunkin; United Mines, Hocking and Loam; South Wheal Towan, J. West; United Hills, J. Sims; Charlestown United Mines, Darlington; W. Fowey Consols, W. West; Fowey Consols, W. West; Polgooth, J. Sims; Carn Brea, J. Sims; East Pool, J. West; Wheal Uny, Hocking and Loam; Hallenbeagle, J. Sims; Bissoe Bridge, F. Michell; Wheal Rose, Hocking and Loam; Polberrow, Hocking and Loam.

STEAM-ENGINES STAMPING ORES, IN DECEMBER, 1841.

Mines.	Engines.	Stroke in cylin.	No. of heads.	Av. weight of heads, lifters, and water col.	Consumption of coal in bushels.	Pounds lifted 1 foot high by a bush. of coal.
		Feet.		Lbs.	94 lbs.	
Balleswidden ..	36 in. *s*	8,0	92	54500	1026	60,337,307
Charlestown U.	3[illegible] in. *s*	9,0	60	30000	364	51,555,332
Wheal Kitty ..	32 in. *s*	—	—	——	——	——
Carn Brea	32 in. *s*	9,0	70,0	38642	799	67,993,021
Tincroft	36 in. *d*	9,0	42	29347	946	49,185,253
Wheal Vor ..	36 in. *d*	10,0	84	54500	1033	52,650,534
Wh. Reeth Con.	32 in. *s*	7,75	36	20645	615	34,195,319

ENGINEERS' NAMES.

Balleswidden, Eustis; Charlestown United Mines, Darlington; Carn Brea, J. Sims; Tincroft, W. and J. West; Wheal Vor, Richards; Wh. Reeth Consols, Eustis.

WHIM-ENGINES DRAWING ORES, IN DECEMBER, 1841.

Mines.	Engines.	Consumption of coals in bushels.	Av. lbs. of water drawn from mine.	Av. height of lifts in fathoms.	Pounds drawn one foot high by a bushel of coal.	Horse whim kibbs, drawn from 100 fms. by a bush. of coal.
United Mines ..	Taylor's.....	876	13143	700	16,091,833	91,6
Ditto	Michell's ...	170	3109	700	12,140,314	66,3
Ditto	Loew's	362	8917	630	11,295,799	55,0
Ditto	Hocking's..	356	14871	710	18,790,994	97,3
Charlestown U.M	.....	146	2003	1400	2,041,423	44,9
Fowey Consols	Davis's	324	7062	630	17,100,451	95,3
Wheal Trewavas	East Whim	90	1000	360	3,333,333	16,6

ENGINEERS' NAMES.

United Mines, Hocking and Loam; Charlestown United Mines, — Darlington; Fowey Consols, W. West; Wheal Trewavas, T. Tippet.

The boilers and air-pump are out of order at Williams's engine, United Mines; the boiler has burst at Polberrow Consols.

Marazion in the Report for November.—For number of strokes of South Towan engine, read 318,776, duty 43 millions.

*** The number of pumping-engines reported this month is forty five. They have consumed 4336 tons of coal, and lifted 41,000,000 tons of water ten fathoms high. The average duty of the whole is, therefore, 54,000,000 lbs. lifted one foot high by the consumption of a bushel of coal.

Marazion, Jan. 10. Thomas Lean and Brothers.

Steam-Engines in Belgium.—It is estimated that there are now at work in Belgium 1300 steam-engines, with a total power of 33,100 horses.—*Galignani.*

Edinburgh and Glasgow Railway.—This great national work is now fast drawing to completion. It is intended to open the line on the 16th inst. for a trial trip, and on Monday, the 21st, it is proposed to open it for the public, and immediately thereafter a general meeting takes place, at which the question of a Sunday train will probably be decided.

Pearl Fisheries of Ceylon.—The principal pearl fishery in Ceylon is that off Aripo, where the oysters lie in from five and a half to seven fathoms water, protected on the west and south-west by a ridge of sand and coral; this ridge is considered by the natives to be a submerged island, but it is generally believed to be a rising bank of coral and sand. The age of the oyster, at its separation from the rock, is stated by an intelligent diver to be six years and a half; the pearls are found in all parts of the fish; as many as sixty-seven have been found in one oyster; they are not generally found in those oysters that would be considered the finest for eating, which favours the idea that pearls are produced by disease in the fish. A single diver will generally bring up in a day from 1000 to 4000 oysters; the fishing takes place in March.

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[Feb. 12, 1842.

ORIGINAL CORRESPONDENCE.

THE TIN TRADE—THE MINERS' COMPANY.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Are we to consider the exhibition made by the Miners' Smelting Company, on the 27th ult., as the last dying speech and confession of their tin smelting business, or are they determined to make another struggle before expiring? Verily, the promises of benefit to the miner, made at the outset of this notable scheme, have been brought to a very pretty conclusion, and great, very great, cause for complaint exists, at the result of the proposition for converting an open competition into a monopoly, under the specious plea of regulating the price, and of preventing loss by fluctuations—at a time, too, when more tin was produced than the consumers could take off at the then price of the article.

It is amusing to look back at the great parade that was made in Cornwall at the commencement of this folly, and to read the fine speeches made at the meetings which were then held. The Cornish people have generally been considered to possess a pretty tolerable share of shrewdness and caution in their dealings, but the leading person in this scheme appears to have discovered their weak point, and he did not fail to make the most of his discovery—he tickled their fancy, and fed their gullibility; he taught them to believe that they had been robbed by the smelters, and that, under the then existing state of the tin trade, the miners had no means of defending themselves against the impositions practised upon them, except by the plan he proposed to them, and which, having been adopted by many of them, has now produced such lamentable results.

I have heard it gravely asserted in Cornwall, and also insisted upon, that grese will eat black tin; but, however strange such a thing may appear to be, or whatever difficulty may arise in mens minds to give credence to it, it has been thrown quite in the shade by the adoption of such wild and crude theories as were then advanced in support of the plan referred to; all that could be said or written against it—facts, figures, reason, and common-sense, were cast to the winds, as being beneath the consideration of the party who had made up their minds to support this panacea for all their wrongs. In the report of the speech made by Mr. Vigers, at the meeting which was held at Helstone, there is the following very encouraging and attractive promise made to the miners who would join the new company:—"In carrying out that object, it is absolutely necessary for your well-being, as well as for the success of the measure, and for the protection of the parties who undertake it, that there should be unanimity amongst us, and that those parties should possess the entire control of the market, and be placed in a position to hold the article which is so amply protected, in order that the trade may be reduced simply to this position—that the consumer comes into the warehouse where the article produced is deposited, and takes that article from the warehouse, at the price fixed, per quarter, or such other time as may be considered best. Generally, it will be the quarterly price. The price of common, the price of refined, the price of grain, or granulated, tin, would be in the merchant's office. There would be no question, no quibbling about it. 'That is my price, there is my tin.' Business would be done pleasantly, the prices would not vary, and quarterly you would receive your returns, according to the advances you have made, so much per cent., as the produce of each mine stock sent in. When once in working, all will go on as smoothly and pleasantly as, I think, any trade possibly can go on; and so it ought to be, or what is the use of the peculiar advantages of the position in which that trade is placed?" "And so it ought to be." But has it been so? The two sales made by the company give a contradiction to it. It will be said, in reply, probably, that the position contemplated depended upon unanimity between all the miners, and that the failure was the consequence of some of the miners not joining in the scheme; but we were informed at the time, that five-sevenths of them had joined in it, and it must be clear to the comprehension of a very weak intellect, that two-sevenths of the produce could not control the market. If the company had acted upon the proposed plan, and have kept their tin in their warehouses until the two-sevenths had been disposed of, the consumers must come to the other five-sevenths for a supply of the quantity they might require—indeed, it was evident, from what was said at the time in favour of the new company, that it was expected such would be the case, and, in the Journal of the 22d August, 1840, you make the following remark:—"We do not pretend to say that it is perfect—it may, and, no doubt, will, require modification—but that the tinners will never return to the old system, which may be said to be exploded, is quite certain." But, how has it happened, that the company, instead of keeping their tin in their warehouses, and of carrying on their business "pleasantly," have had recourse to public sales, and have thus, within the short space of three months, thrown 2000 tons of tin upon the market? Was this done out of affection and regard for the tin miners? or was it done to punish those who would not join them in their smelting scheme? The latter object has been gained by it, but, in punishing them, they have brought their friends into the same situation.

Mr. Vigers, when at Helstone, made some severe remarks upon the cutting and underselling system which he said had been adopted by the smelters, but, in those two instances, he cannot accuse them of being the cause of the present depressed state of the trade; whilst they have been endeavouring to keep the price up, the company, by this unusual mode of proceeding, which is in such direct opposition to the "pleasant" mode they proposed to adopt, have forced the price below anything that has been experienced for many years, and have thus manifested what was meant by their expression of sympathy for the "poor miner." The scheme has been tried, and the verdict is that of condemnation, which has been followed by a confession, for nothing can be more clear than the acknowledgment which the public sales have made, of the whole thing having ended in a miserable failure. Nothing now remains but to do execution upon it, and it is to be hoped that this will not be long delayed, lest any more mischief should be produced by it.

The miners of Cornwall have great cause for complaint against the authors of this wild, and worse than visionary, scheme; it has upset the tin trade, and produced a revulsion which may lead to distress and misery, by depriving a large number of poor men of employment, and thereby preventing them from earning a maintenance for themselves and families. In times like the present, when trade is depressed, and a difficulty is experienced in obtaining a remunerating price for produce of all descriptions, it does not require such a proceeding as that which the company has lately adopted to throw down the price of tin; but, having succeeded in effecting this object, it is much to be feared that, unless it be by the reduction of the quantity produced, a reaction is not to be hoped for, and the remedy will be one of a most deplorable character. And all this has been produced by a grasping and selfish proceeding of a very few individuals, who cared as much for the "poor miner" as for the poor African.

There is another passage in Mr. Vigers's speech, which appears to me to be very opposite to the present circumstances of the company. It is in reference to the proceedings which he stated had been adopted by the smelters, and of which the following is a copy:—"If these men, by their combination (though they are few in numbers), and the ridiculous system of ticketing, had not you to fall back upon, to remunerate themselves for the sacrifices they may make, they would not be such fools as to throw their money away, if they had not a hope of getting it again from you. And from you it is they get it, for if anybody will take the trouble to trace their operations after sales at a falling price, and will trace their operations to the next series of ticketings, they will find that it is out of the labour of the miner—out of the crushing of the poor miner—forming so large a portion of the population of this county, and that it is not out of the pockets of the capitalists, that the smelters refil their own pockets for the sacrifice they have made for their own gratification, arising from their own bad passions." Have not the Miners' Smelting Company been pursuing and acting upon the very same system as that which provoked the expression of Mr. Vigers's "righteous indignation" against the smelters, in the words I have quoted above, and in a way of greater severity to themselves than the other smelters could ever command? What was the original intention of this smelting company? I give it to you in Mr. Vigers's own words, and I presume that no person will question the authority:—"The remedy proposed to you, gentlemen, to cure this evil, is, that two houses should unite, for the purpose of smelting your tin, selling it, and acting as your agents—you to have all the benefit arising from that operation with the exception of a fair remuneration in the shape of commission, and guarantee to those houses which so act for you. All the white tin produced from your black, of whatever nature or description, is to be for your benefit, and not for the benefit of the houses. You will hereafter have all the advantages that can possibly arise from keeping the control of the same, as well as the foreign, market guided by the regulator I have stated." Thus it is as clearly explained as words can do so, that the company can have nothing to apprehend from a fall in the price of tin; whether it sells at 60*l.* per ton, or at 90*l.* per ton, they have only to account to the miner for the balance of the proceeds, after deducting smelting charges, and a fair remuneration for selling and acting as their agents. The reduction in the price of the article, which has been produced by their forced sales, must, then, be borne by the miner—"the poor miner"—and they are the parties who will be "crushed" by it, not only those connected with the mines to which the tin belongs, but all miners connected with, or dependent upon, tin mines for the means of support.

I have said that the company can have nothing to apprehend from a fall in the price of tin, and, perhaps, I have been rather premature in this assertion, as it has brought to my recollection a part of the agreement which was made with the miner, and which may influence their position more prejudicially than I at first conceived. It was a part of the arrangement, that the smelting company should advance to the miners 70*l.* per ton on the tin contained in the ores carried to the smelting-houses, and, after the ores were smelted, and the tin was sold, a certain amount was to be deducted from the produce of the sale for returning charges and commission; and the difference between the net proceeds, after making those deductions, and the 70*l.* per ton advanced on account, was to be paid to the miner in the shape of a bonus and I have been informed that, for the first two quarters, a bonus was paid. Now, the price at which the tin was sold at the last sale, will not only produce a considerable loss upon the advances made to the miner, but there are also the expenses of returning charges and commission to be provided for. Are the miners to be called upon to repay the differences which those items will make in their account of sales? or, in Mr. Vigers's words, have the company the miners "to fall back upon to remunerate them for those sacrifices?" If this be the case, those proprietors of mines who have lent themselves to this humbug will be justly punished, and, at far as they are concerned, no person will offer them any sympathy.

The ruinous consequences which have thus resulted from this uncalled-for meddling in the tin trade, should lead the copper miners to put the question to themselves—"What have we to expect from the same parties having become copper smelters also?" and no one can doubt, not only the propriety, but the necessity, of such a question being put, as the parties are the same, and the declared object of their becoming copper smelters, as well as tin smelters, was the same. Now, it is an every-day experience by men of business, that it is much easier to purchase an article than to find purchasers for it; and also that it is not an easy matter to drive old connections out of a trade, and thereby to secure their customers. The smelters, no doubt, experienced the truth of this in the tin trade—hence the accumulations of stock, and the forced sales, with their deplorable results. Is the copper trade free from this difficulty? Certainly not. Are we, then, to have a similar experiment made upon it?

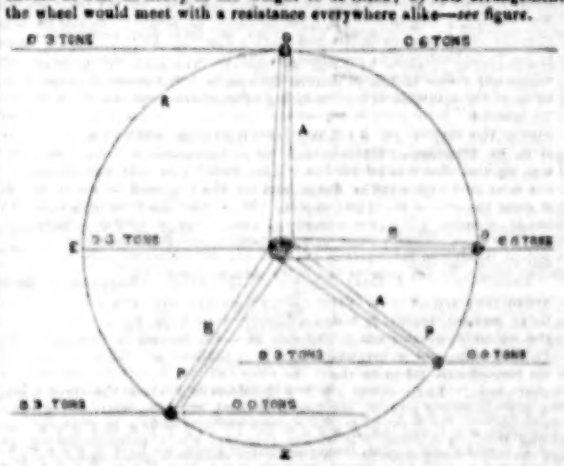
London, Feb. 10. ONE OF THE SUFFERERS.

[Some remarks on this communication will be found in another column.]

ON THE CONSTRUCTION OF WATER-WHEELS.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—In my last I promised to send you what I considered a remedy for the evils there spoken of, if the fallacy of what I there state was not proved, which I think has not been done, for your correspondent, "D. W. B.," of Flintshire, rather proves my assertions than otherwise, inasmuch as he says, the work in the shaft goes five strokes to every revolution of the wheel, from which I infer that the wheel moves very slow; but, Sir, a wheel constructed upon the "cog" and "spur" principle, has very great need that every drop of the water should tell, for it is generally supposed that the friction on the "cog" and "spur" destroys a great part of the moving power, for the more complicated, and the more bearings a machine has, the greater must be the power to overcome the inertia. Therefore, I think, if the cranks can be so applied as to make the resistance continuous and uniform, it would be far more easy to the wheel than the "cog" and "spur;" to do which I propose to use two cranks, one on each side of the wheel, as is commonly used at present, but, instead of fixing them, so that one should be up, whilst the other is down stroke, I would propose to fix them at right angles with each other—that is, that the one should be up when the other is at half stroke, and to have a balance-bob attached to each crank behind the wheel, which should be half as heavy as the weight to be lifted; by this arrangement, the wheel would meet with a resistance everywhere alike—*see* figure.



Let A and B be two cranks, three feet long each, fixed at right angles to each other; let C C C C be the pump-rods, and D D D D balance-rods, with a uniform weight. Now, suppose the weight of water to be lifted by each crank, at each "stroke," six tons, and the balance to be attached to each balance-bob three tons; then, when the cranks A and B get at O O, the crank A will be acting with the greatest resistance on the wheel, and the crank B will not be any, from which it will be seen, that the wheel at this point will be lifting 6—3=3—tons, about a circle whose radius is three feet; and that this will be the uniform resistance is evident, for as the crank A moves towards B, its resistance will decrease in the same ratio as the resistance of the crank B will increase, until the crank A gets at the point E, when B will be acting with its greatest, and A with no resistance at all, at which point the pump-rods begin to descend from the crank A, when they lose their weight, and the wheel has got to overcome the balance only, which would be three tons, which will be equal to its resistance in the up stroke, at the same angle with the rods. As the crank A moves from E to F, its resistance will increase in the same ratio as that of the crank B decreases in moving from O to E, and so on—consequently, there will be a continuous and uniform resistance for the wheel to overcome through every point of its revolution, from which I think it might be driven very slow, and at a uniform velocity, and with a great deal less friction than would be caused with the "cog" and "spur" construction. A MINER.

Bicklegh, Feb. 7.

SPELTER MANUFACTURE—BLACK JACK.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Having seen, for some time past, in your valuable Journal, a number of letters respecting the ores of zinc, and the conversion of them into spelter, I beg to offer some remarks upon that subject. One of your correspondents, who signs himself "A. B.," has, no doubt, an interest in the old manner of smelting, and "H. E.," I should say, has something to do with the improved process. If my conjectures be right, the poor miner will not benefit much from their communications. "H. E." states that blende is known to be abundant in this country—perhaps he may wish it to be the case—but I can assure him, that, although he may, at nearly any mines of copper or lead, obtain specimens, yet, when required in quantity, will find it very scarce. Much has been said of the great expense of erecting furnaces, and of the improved process of smelting, but, after all, the Germans made out being expensive, why do not the manufacturers adopt their plans? You state, in your note to the "Black Jack Miner," that the result of 2000 tons of Isle of Man ore would only be 750 tons of spelter. Now, I know for a certainty, that the Isle of Man ore yields, on an average, more than 34 per cent., though, from containing a considerable proportion of iron (which injures the pots), it is not smelted by itself. The red blende from Wales, with which it is mixed, does not produce so much, although a richer ore, as it is not well dressed, and the slime generally sent with it being very poor. English spelter has been rolled in Birmingham, and was quite as good as the foreign; I believe it was obtained from the red blende. I should say, that, if properly calcined and provided—the ore does not contain much iron—English spelter would be, in every respect, equal to any that is sent to market. If the miner obtained a fair price for his ore, it would enable him to dress it so clean that the result would soon be apparent to the smelter, as, instead of obtaining 6 cwt. 3 qrs. from one ton of calcined ore (the average of a three months' working of the Isle of Man and Welsh ores mixed), they would get from 8 cwt. to 9 cwt., which, at the present price of spelter, would be more than 3*l.* in their favour, besides the saving of coal, labour, &c. From the increasing demand for manufactured zinc, and its daily application to some new purpose, there is not much doubt of the miner soon obtaining a fair price for his ore. F. K.

London, Feb. 9.

[Does our correspondent mean that 34 per cent. produce in metal is obtained from the Isle of Man jack? if so, we are at issue; but if he confines himself to the produce by assay, we are then agreed, it being notorious that a considerable loss is sustained in the process of manufacture. We assumed 1000 tons of ore to represent 750 tons of metal, being 75 per cent. produce. We believe the average make is about 28 per cent., without reference to the richness of the ore, *per se*.]

IRON TRADE—DEAN FOREST FURNACES.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Allow me to correct an error you have made, or some one has to you, about the Dean Forest furnaces, in case it may be repeated next week, in remarking upon them, as you contemplate; and it is a pity there should be any error creep into your very valuable Journal. Please to understand that Messrs. Crawshay and Allaway have three furnaces at Cinderford, and Messrs. James and Montague have two at Park-end; I believe two out of the three at Cinderford are in blast—at Park-end both are out of blast. You have named seven furnaces—there are but five in all, independent of a little experimental cupola, scarcely worth naming, belonging to Mr. Mushet, at Dark-hill. A CONSTANT READER.

Bath, Feb. 7.

N.B.—Mr. Rogers, "On Blast-Furnace Data," really deserves a crown of gold.

ON THE USE OF HOT AIR IN BOILER-FURNACES.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—For some weeks past I have watched with much interest the controversy going on between Mr. C. Wye Williams and other gentlemen, but my object in now addressing you is not for the purpose of remarking on the discussion; however, I cannot help saying there are sound arguments to be found in Mr. Williams's last lecture (at Manchester), "On the Use of Hot Air in Boiler Furnaces," wherein he shows that the well-known law which governs expansibility of heated gases ought to be well attended to, and his accompanying calculations powerfully illustrate the subject, for we find, in practice, that the atmosphere, at its medium temperature and density, as regards these latitudes, can be made to supply the necessary dose of oxygen to the fuel; and I am of opinion, that, if we adopt Mr. Williams's system, the combustion of bituminous coal may reach its *maximum* extent—that is to say, all the products may be made to combine with oxygen to that atomic saturation, without which there will be an unnecessary waste of fuel; whereas, if air, at a very high temperature, be sent in, the calculations above allusied to most clearly prove that it will be difficult to introduce, in due time for effective combustion, the necessary *quantum* of oxygen. If these arguments have for their basis truth, Mr. Williams is fully borne out that injury, instead of benefit, will result from the application of hot-blast to boiler-furnaces; but far different is the fact with smelting-furnaces, where forced air is used, particularly when anthracite is the only fuel to be procured; in this (latter) case, it is an absolute condition that hot air becomes the only medium of supply, as stone coal cannot be made to combine sufficiently with oxygen, if the air be sent into the blast-furnace at the usual temperature of the atmosphere. For this reason, Mr. Editor, I solicit a place in your columns, so that I may, as I have done before, respectfully warn those who embark in this comparatively new enterprise, to have their blast apparatus so powerfully-constructed, as to force in enough of the attenuated hot air to supply the atomic quantity of oxygen, due to this highly carbonaceous and remarkable fuel. I believe I was the first person who publicly noticed this known property of expansibility of air—that is to say, as to how it would affect the ironmaster (*vide Mining Journal*, Sept. 25); I very naturally, therefore, take great interest in its development, and I cannot refrain from again advising the anthracite coal and ironmasters to pay great attention to the subject, and make themselves as familiar as possible with its details, and *modus operandi* in the blast-furnace, as I feel confident, that on thoroughly understanding this immense increase of bulk in the injected heated atmosphere depends much of the success of iron making; and I repeat, that if sound chemical and mechanical calculations were made by competent persons, previous to the erection of iron-works, we should not be surrounded with such melancholy results as are too frequently before our eyes. LIONEL BRIGHAM.

Neath, Feb. 4.

STEAM-BOILERS—ECONOMY OF HEAT.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—A great deal has, from time to time, been written upon the capability of iron for conducting heat when used for steam-engine boilers, and there can be no doubt that for cheapness and usefulness it is the best metal that can be employed for such a purpose; but whilst the attention of the mining and manufacturing community has been directed to the facility with which heat is transmitted through the medium of an iron plate in generating steam, little has been said of the rapidity with which the same material emits heat to the atmosphere, and no plan, that I am aware of, has been published by which heat so lost may be intercepted, and a considerable portion of it retained. Numbers of boilers, and particularly such as are used in mining, are without any covering or shelter from the atmosphere, and, in almost every case, are besmeared with tar or dark-coloured paint, which has a tendency to resist the radiating power which iron possesses to a high degree; and when it is considered that boilers of this description have, on an average, 100 feet of surface exposed, a very great abstraction of heat must be the natural consequence, and a corresponding consumption of fuel and destruction of the fire grates and flues must follow. To remedy this a cheap and simple plan has been adopted at a manufactory in this town, and though there is no new principle involved in it, yet it is so far efficient and satisfactory as to recommend itself to more general application. It is acknowledged, I believe, that "those substances which radiate the least heat, on the contrary, intercept the most," therefore choice has been made of a material which might combine durability with cheapness and utility—and of tin, zinc, and lead, the latter was preferred; and the boilers in question were covered with sheet-lead one-sixteenth of an inch in thickness, and weighing 4 lbs. per foot. This plan has been found to be so advantageous in practice, as regards the saving of time in raising the steam every morning, and in the saving of fuel, that it was determined to ascertain to what amount this was effected; the result I herewith send you. The boilers here spoken of are used for working a high-pressure engine of thirty-horse power; they are eighteen feet in length, and usually work with 25 lbs. pressure on the inch. In this state the bulb of a thermometer was placed upon the lead and in contact with it, and in this situation the mercury indicated 174°; on removing the lead and applying the instrument to the iron boiler, the mercury fell to 165°—making a difference of 9°. The thermometer was then suspended at the distance of half an inch from the lead, in which situation 160° was indicated; but at the same distance from the iron the mercury rose to 116°, and at the distance of two inches the result was the same—lead 69°, iron 105°—being a difference of 16° in each case, therefore it would appear that Lead absorbs, or has greater capacity for heat in this situation than iron.. 9°
Lead parts with heat with greater reluctance, or radiates less than iron.. 16°

Difference in favour of lead..... 25°

This result, in comparison with the maximum heat indicated 174, is equal to 13 per cent. saved by this simple application. In the consumption of fuel this result is confirmed, and theoretic speculation is entirely removed from the subject. The average consumption of coal, by these boilers, previous to the adoption of this plan, was 60 cwt. per day, but now 50 cwt. is found to be amply sufficient, therefore a positive advantage is obtained of 10 cwt. per day, which is one-sixth, or 17 per cent. In many places this would be of greater consequence than here, where fuel is cheap, but a very great, and in every case, the saving of time and preserving the

machinery is of importance, and where four or five boilers are required for working powerful engines, it is a question whether or not one of them might be dispensed with, and, if so, the saving of capital by that means is a consideration worthy attention. The expense of adopting this plan is so trifling, and the benefits to be derived from it so obvious, that there is no obstacle in the way of its general adoption, having three good recommendations—protection for the boilers, economy of heat and fuel, and preservation of the fire grates and flues. T. E. WILKINSON.

Sandhill, Newcastle-on-Tyne, Feb. 4.

MR. C. HOOD'S PAPER ON THE CONSTITUTION OF COAL.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Mr. Hood continuing to assert, with apparent triumph, that Dr. Kane had criticised his paper "On the Chemical Constitution of Coal," before he had read, or even seen it, and that his opinions were, therefore, incorrect, as being founded on the mere abstract printed by the Institution of Civil Engineers; and, further, that I had published Dr. Kane's criticisms, though aware of that fact, I considered it necessary, in my own justification, to draw that Professor's attention to those reiterated assertions. I now beg your insertion of his reply, as it involves not merely a contradiction of Mr. Hood's inferences and facts, but places his paper (or "essay," as Mr. Hood calls it) in its proper light before the public. For myself, I need only say that I should not have ventured to assert that there were errors in Mr. Hood's paper, from the perusal of a mere abstract of its contents; but having carefully read the original paper, and even copied the most important passages, it was manifest that either Mr. Hood or myself was in error, and had incorrectly read the several authorities from which our facts were taken; for Mr. Hood had no more right to characterise or defend his paper, as one containing any original facts or views of the properties of coal or its constituents, than I should, with reference to my own Treatise on Combustion—my object being merely to take the chemistry of combustion, and the nature and properties of coal, from other and higher authorities, and to apply them to practice, by showing their connection with the furnace. Under these circumstances, and as an additional guarantee that my own facts and inferences were correct, I took Dr. Kane's opinion on Mr. Hood's paper, and published it in the second edition of my Treatise. With respect to Mr. Hood's charge, Dr. Kane writes—

18, *Upper Gloucester street, Dublin, Feb.* 3, 1842.

MY DEAR MR. WILLIAMS,—I have again compared the abstract of Mr. Hood's paper with the perfect copy, which he had the goodness to send to me, and I consider it, so far from being brief or imperfect, to be a very full exposition of all the main points of Mr. Hood's views, and, indeed, to enter into more specific detail than is generally found in abstracts of scientific papers. The abstract is more than one-sixth of the length of the paper—a proportion which certainly few more abstracts will be found to reach. As to my not having a right to judge of the paper from the abstract, the case stands thus:—If it were an abstract giving the general results of a train of original experiments, it should certainly have been my duty—no matter how singular its statements might be—to await the publication of the full details, before expressing any opinion upon them; and so I should have done, but the abstract in question was of a totally different nature. Mr. Hood never analysed coal himself—he merely copies the results of others—he never made original determinations of their heating powers—he never analysed coal gas himself, or ascertained the nature and proportions of the other products of their distillation, —he never, in any degree, that appears from his paper, or that I ever heard of, augmented our positive knowledge of the subject of fuel, or combustion, by a single fact. He draws up a more popular sketch of the labours of others, from which he deduces consequences, such as I believe to be incorrect in many instances. These deductions are given as explicitly in the abstract as in the paper; for all such expressions as he thought most important, are marked in *Italics* in the abstract, and are literally the same as in the complete paper. If it were decided to be improper to pass judgment upon an abstract, a writer would only require to bring forward any doctrine or assertions he chose, *in abstract*, and, trading upon a floating capital of reputation so established, postpone the evil day, until it might suit his object or his leisure, to publish the complete papers. I state this only as a possible case of the principle which Mr. Hood advocates, and positively disclaim any intention of applying it in the present instance, as I am very far from considering such motives to have influenced Mr. Hood. I insist, however, that, as there were no original facts in his paper, and that the sources from which he drew his information were as accessible to any other scientific man as to him—his opinions being, as I think they are, fairly represented in the abstract, there were quite sufficient grounds for my taking the part I did. It is, however, only for the principle that I notice this point between *abstract* and *paper*; the important question, however, is—Whether Mr. Hood be right or wrong in his opinions? and should there be occasion for the further discussion of them, I will throw the abstract overboard, and take the complete paper. Believe me, very sincerely your's,

To C. W. Williams, Esq., Liverpool. ROBERT KANE.

I think it will not now be doubted that Dr. Kane has taken a correct view of the subject, thus putting an end to the charge of unfairness insisted on by Mr. Hood. The sources from which Mr. Hood drew his information were as accessible to me as to him, and it was fairly open to me to question the correctness of his collation and inferences; but it is in the effort to clothe this "more popular sketch of the labour of others" in the garb of originality, that he has fallen into error. With respect to Mr. Hood's allegation, that the paper contains statements directly the reverse of those attributed to him, this appears easily reconciled, inasmuch as there are contradictions in the paper itself, which provide a *utrum horum* facility for avoiding any charge of error. As some of these points go to the very essence of the question, as regards practice (the only object I have in view), and as abundant opportunities will present themselves as we go along, I shall be glad to discuss them as they successively arise.

In reviewing my Treatise (manifestly for the sole and worthy purpose of endeavouring to pick holes in it), Mr. Hood appears to have taken the same erroneous view of it that he has done of his own, but of which Dr. Kane has so exposed the fallacy—namely, the considering it as containing new or original chemical facts or views. For myself I disclaim any such pretensions—my labours and inquiries (the result of a long life of scientific and practical attention to the subject) being directed solely to the applying the chemistry of combustion to practice, since, as stated in my Treatise (*p.* 15), "in undertaking, myself, to lead others, and to avoid the imputation of presumption, I observe, *in limine*, that I do not affect to give any new view of the nature of combustion, much less do I make any claim to discovery. What I take credit for is, the practical application, on the large scale of the furnace, of those chemical truths which are taught by the oldest chemists of the day, and so well known in every laboratory. I also take credit for bringing together the scattered facts and illustrations of such authorities as bear on the subject before us, and so arranging and applying them (with such additional illustrations as appeared to me conducive to the object in view), as will, I trust, enable practical men, without going deeper into the science than is compatible with their time and other avocations, to understand that part which chemistry has to act in the construction, arrangement, and working of our furnaces, by which means only will they be enabled to neutralise that opposition and counteraction which ignorance and prejudice, under the assumed, though erroneous, title of 'practice,' are so apt to give to the suggestions of science." In any further review of my Treatise on Combustion, therefore, Mr. Hood will perceive that I take no interest in proving its chemical details and facts to be correct, but will rather be pleased to find any new light thrown on the subject, regardless whether such new facts shall emanate from the labours of Mr. Hood or from the original authorities. W. C. WILLIAMS.

Liverpool, Feb. 7.

THE BUDE LIGHT—ITS INVENTOR.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Now that the papers teem with accounts of the successful application of this new process of illumination, may I beg of you to inform your readers to whom the public are indebted for what is universally admitted a great national benefit. If I am rightly informed, the parties who possess the patent, and who are likely to reap great advantages from its use, secured the invention in anything but an honourable manner, and should not be in the enjoyment of reputation that rightly belongs to others. My information is this:—Mr. Lobbold (a gentleman to whom your readers are indebted for much useful information) prepared a paper on a plan for the prevention of explosions in mines, and entrusted it to Dr. Lardner, to be presented by him to the British Association, at the meeting at Newcastle. The Doctor, finding it contained a suggestion which he thought might be turned to great advantage, thus made arrangements with Mr. Gurney for taking out a patent, and securing the exclusive right of the application of this said light, which was fully described in the paper referred to. If this information be correct, and which I have every reason to believe is the case, it is only right that the public should be in possession of it. J. J.

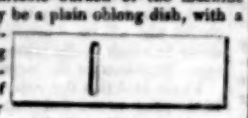
Gray's Inn, Feb. 2.

[We were unacquainted with the circumstance referred to by our correspondent, but will endeavour to obtain the particulars, for, if true, it is most disgraceful conduct on the part of the "appropriating" Doctor, and well deserves public exposure. Mr. Lobbold has left London, having, we are informed, been appointed to the curatorship of some northern literary institution, so that we are unable at present to obtain information—perhaps our correspondent can ascertain further particulars.]

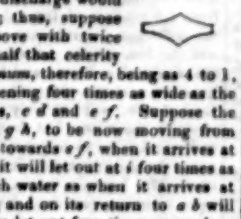
IMPROVEMENT IN THE DESCENT AND ASCENT OF MINERS.

TO THE EDITOR OF THE MINING JOURNAL.

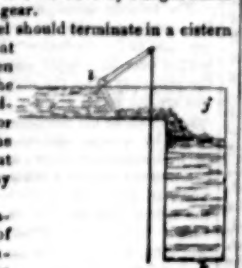
SIR,—It may be well to begin my explanations spoken of last week with a description of the form of sluice I should employ to fluctuate the discharge of water on a wheel in moving the ladders; the object of which graduation of the water is to meet the variable burden of the machine hereafter to be described. This sluice may be a plain oblong dish, with a slit transversely, thus, made to slide horizontally forward and backward on a long orifice, in or near the bottom of the discharging cistern, which orifice may be of any form suited to the proportions of water to meet the variable burden throughout the revolution of the wheel.



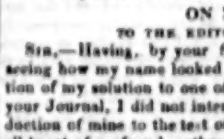
If a water-wheel were employed to move my train of wheel-work, and ordained to go one revolution for each stroke in the shaft, there would be two points of *maximum* velocity, or labour, consequently if the above valve or slit were made to alternate contemporaneously with the shaft-work, before an opening of this form, the discharge would be very nearly variable with the burden; thus, suppose the cranks, as will appear hereafter, to move with twice the mean celerity at half stroke, and only half that celerity at the dead points, the *maximum* and *minimum*, therefore, being as 4 to 1, we have to make the middle, *a b*, of the opening four times as wide as the ends, *c d* and *e f*. Suppose the slit, *g h*, to be now moving from *c d* towards *e f*, when it arrives at *a b* it will let out at *i* four times as much water as when it arrives at *e f*; and on its return to *a b* will again let out four times as much as when at *c d*. This dish is of iron, and to be worked by a slight crank and gear.



The water channel on the top of the wheel should terminate in a cistern two or three feet deep (see *fig.*), so that when the machine gets burdened by men ascending, the issue shall increase with the height of the column, *j k*, the water being admitted from the reservoir by a hand governor at *i* to produce any pressure at *k*, where the fluctuating jet is placed, and which lets out very nearly the same proportions under any height of column.



I would also employ a governor or fluctuator on this principle for the admission of steam upon the piston where the steam-engine is to be preferred, for which it strikes me the best arrangement is to let the piston go eight strokes for each one in the shaft, then the fluctuating orifice would be modified thus—



the dish and slit therewith being similar to those above for the admission of water; and the hand governor being of the usual construction, without these fluctuators, either the water-wheel or the steam-engine would require a fly-wheel of more than ordinary momentum. I have not given the geometrical solution of the contour of this orifice, from a conviction that it would be more curious than useful, provided the workman imitate the above figure and prescription, which is sufficiently approaching the truth—by request, however, I will do so. JOHN PHILLIPS.

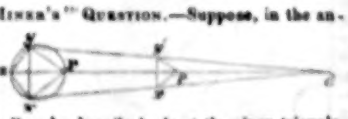
Tuckingmill, Jan. 26.

ON MINE SURVEYING.

TO THE EDITOR OF THE MINING JOURNAL.

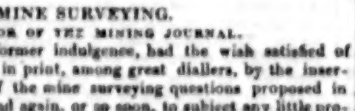
SIR,—Having, by your former indulgence, had the wish satisfied of seeing how my name looked in print, among great diallers, by the insertion of my solution to one of the mine surveying questions proposed in your Journal, I did not intend again, or so soon, to subject any little production of mine to the test of such an ordeal; but although I cannot at all boast of profound mathematical talents or attainments, yet, taking a little interest in inquiries of this nature, and no solution having as yet appeared to the two questions proposed in the Journal of the 1st inst., I again venture to trouble you, and attempt the same in my poor manner. By-the-bye, I beg to observe that the sort of solution to one of those questions that appears in the last week's Journal, by "Optimus," seems to me to be incorrect in principle (in the only part of the question, too, where any difficulty appears), inasmuch as he has assumed the perpendicular of the given triangle, *x y z*, to be part of the required line *d z*. Now, "Optimus" must pardon a poor silly cartman, like me, for differing with him in this respect, for I cannot discover that the conditions of the question, as proposed, warrants such an assumption; in fact, I venture to say, with all due respect for Mr. "Optimus," that the perpendicular of the triangle in question is not a part of the required line *d z*, nor does *d z* cut the base *x y* at right angles. That his result in this part of the question comes so near the truth, or correct length of *d z*, is because the sides of the triangle, as well as their difference, is so small compared to the whole line *d z*.

SOLUTION OF "A COAL MINER'S" QUESTION.—Suppose, in the annexed diagram, *x y z* (the three props named), and *d* the extreme point from pit A, B, from whence the magnetic bearings are taken to the said props. Let a circle, *z y P x*, be described about the given triangle *x y z*, cutting *d z* in *P*, and join *x P* and *y P*; then we have given the triangle *x y z*, and the $\angle x y z = 36° 11' = \angle x P z$, and $\angle y x = \angle y P z = 43° 32'$; also, from the courses given, we have $\angle y d z = 4° 7'$, and $\angle d z = 3° 12'$—hence, as angle *x y z*, or *y P z* = *P d x* + *P x d*, therefore, in the triangle *x P d*, all the angles are given, and $\angle d x P = 32° 39'$. In the same manner we find all the angles of the triangle *y P d* = 4° 7', 35° 25', and 136° 28' respectively, and also $\angle x P y = 79° 43'$.



On *d z* assume any point *p'*, at a given distance *a*, from *d* draw *p' s'* and *p' y'* parallel to *P y* and *P x*, and join *y' s'*, then in *y' s'* evidently parallel to *y z*, and we obtain $y' s' = \frac{a \sin 4° 7'}{\sin 39° 25'}$ and $z' s' = \frac{a \sin 3° 12'}{\sin 32° 59'}$ and, consequently, $\angle x y P = y x P = 46° 47'$, and $\angle y x P = y z P = 53° 31'$—hence, then, in the triangles *d y x* and *d x z*, all the angles, and the sides *y z* and *x z*, are given, from either of which is found $d z = \frac{417·6}{\text{sine } 53° 43'}$ = 703·62 feet, or length of level required.—Again, to find the depth of the pit to be sunk at *z*, we have 371 — (304 + 16·45 + 294) = 30 feet, the depth required.

"A MINER."—Suppose E, in the annexed diagram, to be the engine-shaft, and A and B points (perpendicularly above the given marks A and B, in the thirty-nine and fifty-nine fathom levels), situated in a horizontal plane touching the surface at E; join A B, and produce it cutting E P (a line *ad infinitum*) in P; then there is given E A, S. 63° E.—107 fathoms, or 972·7 links; E B, S. 27° E.—134 fathoms, or 1219 links; and E P, N. 63° E., the maximum rise, and also its inclination to the horizon of 71°, also $\angle E A B = 24°$, $\angle B E P = 6°$, and $\angle A E P = 32°$. In the triangle E A B we have E A and E B, and $\angle B E A = 24°$, also given—hence $\angle E B A = 59° 30'$, and B A = 512·7 links, consequently B A, the required direction of incline intersecting A and B, is S. 56° 30' W.—Again, let E P be a plane perpendicular to the horizon, to which draw the perpendiculars A D and B C; then E A cos. 32° = E D = 825, and 825, tangent 71° = 1067·61, the rise from E to A. And E B, cos. 8° = E C = 1206, and 1206, tangent 71° = 1560·77 = rise of surface from E to B. And as radius : cos. 42° 30' :: 71°·5 : 5° 32', the angle of depression of the surface in direction of the inclined plane B A.



Let, again, B' B A F represent a vertical section of the strata in direction B A F of *fig.* 1, and B H horizontal lines; take I B = twenty fathoms, or 182 links, and I A perpendicular thereto; take I A = 512·7, join B A, and produce it *ad infinitum*; also produce B I to B, and = 695 links, and A A' parallel thereto, and = 463 links; from B, through A draw the surface line B' A' F, meeting the incline B F in F, the adit of the incline. In the right-angle triangle, I B A, we have I B and I A—hence $\frac{\text{I B}}{\text{I A}}$ = tangent 19° 30'= the angle of elevation or depression of the incline. To find B' F and B F, we have angle B' B F = 70° 30', angle B B' F = 84° 27', angle B F B' = 25° 2', and the side B' B = 695 links from which is easily found B' F = 1548 links, the length of the surface line, and B F = 1635 links, the length of the incline plane. The triangle E B F, in *fig.* 1 being thus found, we readily find angle B F E = 50° 49' and B E F = 78° 57', and E F = 1207 links, and bearing from E S. 3' E. Also, angle F E P = 86° 57' .·. E F, cos. 86° 57' = 64·22, and 64·22, tangent 7½° = 8·45 links, F is situated above E = an angle of 6° 25' with the horizon.—Q. E. D. BOB JACKSON,

Wingate Grange Colliery, Durham, Jan. 25.

ON MINE SURVEYING.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—Being nothing but a mere "pegging captain" and a "measurer," some of the mathematical questions given in your excellent Journal, on mine surveying, have engaged my attention for my own individual amusement, without intending to meet the public eye; however, since there appears to be a paucity of correspondents to answer the various questions given on this very useful subject, I beg most respectfully to transcribe from my scrap-book the following, in answer to "A Coal Miner" and "A Miner's" questions.

"A COAL MINER'S" QUESTION.—Distance from C to Z 105·8 ft. bearing from ditto to ditto, N. 20° 32' E.; vertical depth from C to Z 36·95 ft.

"A MINER'S" QUESTION.—When the acclivity of the surface is from B to A; distance from collar of incline plane to collar of engine-shaft 181 feet; bearing from collar of incline plane to collar of engine-shaft, N. 59' E.; *d* of incline plane from the horizon, 19° 27'; bearing of incline plane from A to B, N. 45° 46' E.; length of incline plane from B to surface, 244·4 feet.—When the acclivity of surface is from A to B; from collar of incline to collar of engine-shaft, 114·9 feet; bearing from collar of incline plane to collar of engine-shaft, N. 22° 27' W.; from bottom of incline plane at B to surface, 142·1 feet. A CORNISH MINER.

Breage, Feb. 5.

APPLICATION OF WIRE ROPE TO RIGGING.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—A paragraph having appeared in the *United Service Gazette*, purporting to be the result of several meetings of captains, commanders, lieutenants, and other officers of the Royal navy, with respect to the adoption of wire rope, instead of hemp, for standing rigging, it would appear, from the statement put forward, that those officers were opposed to it; but having instituted inquiries on the subject, I find that the objection raised was to iron being substituted for futtock shrouds (which is not so common in the merchant service), as, if carried away by shot, or otherwise, it could not be repaired as hempen rope. This opinion does not apply to wire rope, which is fitted and spliced in the same way as that of hemp, while its surface, opposed to the wind, is little more than one-third, and its weight one-half, that of hempen rope—consequently, ships thus rigged would be much lighter aloft, stand better under the canvas, and require less ballast; these are advantages, in addition to its great durability, which must be admitted by all experienced men, while, at the same time, a saving is effected of 25 per cent. in the first cost. The appearance of the wire rope is very much superior to hemp, and the effects of oxidation, or decay, are entirely prevented by a chemical preparation. From experiments, made by order of the Lords Commissioners of the Admiralty, in the year 1837, it was proved that a 2-inch patent wire rope bore half a ton more strain than a 7-inch hemp rope, while it was not half the weight. I may, as a proof of the durability of wire rope for shipping purposes, and its consequent economy, observe that the schooner *Marshall*, of Grimsby, has been entirely fitted, for nearly six years, with my patent wire rope for standing rigging, &c., and which is now as perfect as when put up. She is now lying in the river near Hermitage Stairs, and is expected to remain there about three weeks. The commander, or officer on board, will, I feel assured, be happy to allow any inspection, should you, or any other parties, think fit to institute inquiries, and personally to inspect the rope, after six years use. I am fearful that I am taking up too much space in your valuable columns, but beg to direct your attention to the following comparative statement—Taking a 3-inch wire rope, and comparing its size, weight, and cost with hempen rope, or chain, of equal strength, the results will be found to be—A 3-inch patent wire rope, weight 6¾ lbs. per fathom; hemp rope, 8 inches, 14½ lbs.; and 1⅝ chain, 36 lbs.—equal to a strain of 16 tons. The comparative cost being—3 inch wire rope, 3s. 8d. per fathom; 8 inch hempen rope, 6s. 3d.; and 1⅝ chain, 7s. 6d. per fathom.

I am happy to say that the use of wire rope, for winding, and other purposes, in the mining and colliery districts, is daily increasing, and I doubt not but that it will be universally adopted, as it becomes known not only on account of its cheapness, but from being less in size and weight, which is of considerable moment in deep mines. It also is far more durable, and not subject to accident attending it, as is the case with hemp. ANDREW SMITH.

Manufactory, Millwall, Feb. 9.

PROCEEDINGS OF PUBLIC COMPANIES.

TRETOIL AND EAST TRETOIL MINING COMPANIES.

A special general meeting of the shareholders in the above companies was held at the offices, St. Mildred's-court, on Monday, the 7th inst., to take into consideration the propriety of consolidating the two companies.

G. H. HEPPEL, Esq., in the chair.

The CHAIRMAN stated that the plan he had before him would sufficiently point out the advantages that would accrue from the two mines being worked together, as then only one direction and one steam-engine would be required, and a great saving thus effected. After great consideration, the directors of the two companies had unanimously agreed to the report which he was about to submit, which, on being read, showed the advantages held out by the union of the two companies, and gave a statement of the terms upon which the directors of both companies had agreed upon, the particulars of which are fully given below in the resolutions passed. The number of shares were 4000 in each company.

In reply to several proprietors, the CHAIRMAN stated that there were in the East Tretoil, 600 shares forfeited. The assets of the two companies was as follow:—

TRETOIL.		EAST TRETOIL.	
Machinery, &c.	£1300	Machinery	£
Ore, tailings, &c.	340	Ore, &c.	
Cash balance, after paying all liabilities	141		
	£1981	Liability	

Captain Morcom valued the Tretoil sett at 15,000*l.*, or the total value of the property at 20,000*l.*; his valuation of the East Tretoil sett was 2000*l.*—making a total of 34225*l.*, with the 1000*l.* to be raised by the call mentioned in the report of 5*s.* per share.

In reply to a proprietor, Capt. MORCOM stated that an engine with 7-inch cylinder, such as would be required for each mine, with shaft, would cost between 4000*l.* and 5000*l.*; one engine would do for both mines. The CHAIRMAN stated that many of the richest lodes in the Tretoil mine run into the East Tretoil; if a junction were not made between the two companies they could not go on.

Mr. DAVENHAM read a letter from Mr. Lamb, in which that gentleman (who is a large holder in the East Tretoil) positively stated that he would not be a party to any exchanging shares with the Tretoil Company, as he considered the Tretoil mine to be worked out, and had an entire opinion of the East Tretoil.—Capt. MORCOM stated the lode to be very

about 25*l.* per fathom; they had it in the thirty fathom level, but the East Tretoil, from the dip of the lode, would not cut it at less than seventy fathoms.—Mr. DEVONSHIRE suggested that a valuation and report should be made by two captains from Gwennap, as this was all a one-sided report; besides, the Tretoil ores were falling off.—Capt. MONCOM replied, that the quantity and quality of the samplings could be kept up.

The CHAIRMAN then, in putting the resolutions, stated that, whatever might be the determination of the meeting, the directors of both companies would be obliged to take certain steps towards the erection of the engines, &c.—The resolutions were then read, upon the first of which Mr. NICHOLSON moved an amendment "That, instead of four East Tretoil shares being given, with a 5*s.* call, for one Tretoil, only three shares should be given, and no call;" which, on being put to the vote, was negatived by a large majority, there being only three hands held up for it.—The whole of the resolutions were then read as follow, and carried, there being only one vote against them:—

Resolved,—That the report now read clearly demonstrates the expediency and great advantage of working the two setts of Tretoil and East Tretoil together, and is hereby approved, and that the same be received, adopted, and entered on the minutes of the companies.

That the directors be, and are hereby, requested to take the necessary steps for carrying the recommendation contained in their report into immediate execution, and to consolidate the two companies, by issuing 1600 new shares, in addition to the 4000 shares already issued by the Tretoil Company, and distributing the same amongst the holders of shares in the East Tretoil Mining Company, in the proportion of one of such new shares to four shares in the East Tretoil Mining Company, on the payment of a further call of 5*s.* per share on the said last mentioned shares, the scrip certificates for the same being delivered up to be cancelled. The setts of the two mines, ores, halvans, and machinery, implements, and other materials thereon, and the cash, and other effects of the same two companies, then to become the property of the company so consolidated, and all debts and sums of money now due on account of either of the said companies, to be paid out of the funds of the said last-mentioned company.

That the foregoing resolutions be now signed by the shareholders present, and that the secretary be requested to obtain the signatures of the absent shareholders of both companies.

The proprietors, after signing their names, then separated.

LONDON AND BIRMINGHAM RAILWAY.

The general meeting of this company was held in Birmingham, on Friday, the 11th inst. G. C. GLYN, Esq., in the chair.

The advertisement having been read, and the seal affixed to the list of shareholders, the CHAIRMAN addressed the meeting. He congratulated them upon the increased receipts and diminished expenditure of the railway. Since the last meeting, the directors had had the company's stock of engines, carriages, &c., valued, and it appeared that the per centage set apart for depreciation had hitherto not proved sufficient, but the directors did not propose any alteration in the plan until it should have been further tried. The carriage stock had, during the last eighteen months, been greatly improved in efficiency. He was sorry that the capital account was not yet closed, although the expenditure under that head was not large. What had been expended during the half-year had been applied principally to the accommodation of the increasing traffic. The honourable gentleman then adverted to the schools recently instituted at Wolverton by the company for the use of their servants, and stated, that so much was the resident clergymen esteemed, that the Dissenters entrusted their Sunday school to his care; the company's schools were open to all denominations. The chairman then referred to the increase of dividend, and to the great number of persons that had travelled upon the railway without accident.

Mr. CREED (the secretary) then read the report of the directors. The following are the main passages:—

The operations of the last six months have been generally satisfactory, but so avoid of incidents requiring special notice, that the directors have little of interest to repeat beyond the continued increase of the company's receipts, and the decrease of their expenses.

The accounts which are before the proprietors exhibit the following results:—The ordinary traffic exceeds that of the corresponding half-year of 1840, by a sum of £28,980*l.* 7*s.* 8*d.*, and this increase extends over every head of receipt, but principally the conveyance of merchandise and cattle. The net rent of the company's estate, in land and houses, exceeds by £802*l.* 10*s.* 1*d.*, the rental of the corresponding half-year; the charge on the traffic, including yearly rates, taxes, and an allowance of 14,643*l.* for depreciation of the company's carrying stock (but excluding interest on loans) is £6734*l.* 16*s.* less than in the half-year ending 31st December, 1840, notwithstanding an extension of the general business of the railway, and the running of additional trains. The balance of interest paid by the company, is also less by £3631*l.* 6*s.* 1*d.* Thus the aggregate increase of revenue and decrease of expenses, show a total of £41,154*l.* 19*s.* 10*d.* in favour of the half-year of 1841. The net profit of £27,824*l.* 11*s.* 6*d.*, added to the undivided residue of the balance of 30th June, £1371. 4*s.*, gives an amount of £31,841*l.* 15*s.* 6*d.*, applicable to the dividend; and the directors recommend that, out of this sum, a dividend be now declared on the company's registered shares of

£4 15 0	per share, on	25,000	£100 shares	£118,750	0 0
1 5 9	.....	25,000	25	29,687	10 0
1 10 4 4-5ths	.....	31,250	32	47,500	0 0
0 15 4 4-5ths	.....	41,500	new £75 (on 20*l.* of which interest at the rate of 5*l.* per cent. per annum has been charged)	37,500	0 0
			Which will amount to	£227,937	10 0

leaving a residue to the credit of the current half-year of 3987*l.* 18*s.* 6*d.* * * *

The directors, in furtherance of their recommendation of support to the projected branch line from Leamington and Warwick to Coventry, have now to propose that power be granted to the directors to conclude an agreement for renting the railway when made, at the rate of 5 per cent. per annum on the estimated cost, not to exceed 120,000*l.*, and subject to an equal division of the excess of profit over and above such rent between the two companies.

Some interesting details, relative to the traffic on the line, were submitted to the meeting, and it was explained that since the opening of the line throughout not a single passenger had been killed.

The report was unanimously adopted, and a dividend, as mentioned in the report, declared. A motion was also passed empowering the directors to lease the Leamington branch line. Messrs. Boothby, Cocke, Jones, Ledsam, and Saltmarshe were re-elected directors. It was stated that the next call of 10*l.* on the quarter shares would take place in July, and the next on the old shares in January. It was explained that considerable improvements were about to be made at the Euston and other stations.—A vote of thanks having been passed to the chairman and directors, the meeting separated.

LLANELLY RAILWAY AND DOCK COMPANY.

On Thursday, the 10th inst., a meeting of the above company was held at the London Tavern, when a very animated and well-conducted discussion took place on the expediency of applying to Parliament for an Act to extend the time for the completion of the works and for other important additions to be made, but, ultimately, on an amendment moved upon the original motion, "that the abstract of the Act be read," it was decided that the company having already completed so much of their line, expended nearly the whole of their capital, and having already a good prospect of profit, they would wait until that hope of profit was realised, when another Act could be obtained for such extension of their line as might be thought expedient. Several bye-laws were then passed, one of which appeared to us to be absurd, not to say dangerous; the object of it was as follows:—Under a certain penalty, the workmen employed in repairing any portion of the line were, if all was right, to stand along side of the rails with their hands close to their sides; if the engine was to proceed slowly, to extend their hands towards the rails—so far good; but if the engine were to stop, they were to *join hands and stand across the line.* The danger of thus standing across the line must be obvious to everybody, and it appears to us that it is intended, if the engineer is not able to stop the engine, the labourers are to present their bodies to effect that purpose.—A vote of thanks was then passed to the chairman, and the meeting separated.

NORTHERN AND EASTERN RAILWAY.

On Thursday, the 10th inst., the half-yearly general meeting of the proprietors of the above company was held at the London Tavern, to receive the directors' report, and for the transaction of other business of the company. The report stated that the opening of the line to Hockrill would take place in April next. The traffic on the line, during the six months ending the 31st of December, amounted to £3,944*l.*, showing an average increase of £61*l.* per week over the preceding six months. The balance in favour of the company for the half-year, after payment of all expenses, amounted to £1855. It appeared that there was some difference between this company and the Eastern Counties Railway Company, in consequence of the latter demanding that they should pay the Government duty for the conveyance of passengers over the Eastern Counties line, in addition to the 4*d.* per passenger, and 7½*d.* a-year already agreed upon, and which the directors were determined to resist. The report was then unanimously adopted, and a dividend of 15*s.* per share declared, after which the meeting separated.

MANCHESTER, BOLTON, AND BURY CANAL AND RAILWAY.

At the seventh half-yearly meeting of the above company, held at Liverpool, on Monday, the 31st inst., the CHAIRMAN (Mr. J. Brancker) stated that they had done more business this half-year than the last. The smallness of the dividend might be attributed to the fact that a party who had been long in their employ had absconded with about 1500*l.*, after carrying on an extensive system of fraud; this defalcation had reduced the dividend about 2*s.* per share.—The statement of accounts showed that the net proceeds arising from the working of the railway and canal for the past half-year amounted to £6952. 10*s.* 4½*d.* Deducting Haywood's defalcations, 1500*l.*, and some bad debts, the disposable proceeds were £5452*l.* 10*s.* 5*d.*, which gave a dividend of £1 per share, leaving a small balance. The report was received and adopted, and the dividend made payable on and after the 1st instant.—In reply to questions, the CHAIRMAN said that 45,000*l.* of the bonded debt had been paid off, and that in the last twelve months 1000*l.* of interest had in consequence of this reduction been saved.

EASTERN COUNTIES RAILWAY.

The half-yearly meeting of the proprietors of the above company was held on Wednesday, the 8th inst., at the terminus in Shoreditch.

A. BOSANQUET, Esq., in the chair.

From the report it appeared that the works were progressing, and the whole line to Colchester would be completed by the autumn of the present year. During the winter the works stood well, except the embankment between Romford and Brentwood, which had caused much trouble and inconvenience. From the traffic account it appeared that the total receipts for the half-year, ending the 4th day of January, amounted to 22,551*l.*, which was an increase of 7016*l.* over the former half-year. By the valuation of the engine and carriage stock of the company, the depreciation was only 632*l.* for the half-year. The net profit balance for the half-year was 11,307*l.*, which, with the net profit on the 4th of July last, gives 9*s.* per share dividend, being about 5 per cent. on the present price of these shares, which is more than was anticipated, as at present not eighteen miles of the whole line are opened for traffic. The total receipts to the 4th of January were 1,855,942*l.* 4*s.* 11*d.*; and the total expenditure 1,847,929*l.* 19*s.* 9*d.*—leaving a balance of 40,312*l.* 5*s.* 9*d.*—The report, after some discussion, was adopted. Four directors were then re-elected, after which a vote of thanks was passed to the chairman, and the meeting adjourned.

METROPOLITAN WOOD PAVING COMPANY.

The meeting of proprietors of this company took place at the manufactory, Millbank, Westminster, on Tuesday last, at which some eight or nine proprietors were assembled—representing, it was said, nine-tenths of the shares. The report of the directors (which possesses no interest to the general reader) was read and unanimously agreed in, without, however, any discussion as to its merits. A call of 1*l.* per share was thereupon resolved on, wherewith to prosecute the manufacture of wood blocks, and further test the most efficacious method of laying them.—[A sumptuous repast was prepared by the directors, which was partaken of by the proprietors and the reporters of the public press, who attended, *cum multis aliis*, and evident marks of satisfaction were evinced on this part of the proceedings, which, of course, went off with great *éclat*. We cannot but deprecate this attempt of enlisting the press in the service, which, however, has not, at least in our case, had the desired or expected effect.]

MINING CORRESPONDENCE.

ENGLISH MINES.

HOLMBUSH MINING COMPANY.

Feb. 7.—I beg leave to inform you that the lode in the 110 fathom level is eight inches wide, intermixed with ore, but not rich. In the 100 fathom level west the lode continues about one foot wide, and worth 14*l.* per fathom; in the level east the lode is small, and at present unproductive. The lode in the eastern stopes, in the back of the 100 fathom level, is eighteen inches wide, and worth 33*l.* per fathom; the lode in the western stopes, in the back of ditto, is twenty inches wide, and worth 34*l.* per fathom. In the ninety fathom level west the lode is fourteen inches wide, and worth 16*l.* per fathom; the lode in the eastern stopes, in the back of this level, is fourteen inches wide, and worth 24*l.* per fathom; in the western stopes, in the back of ditto, the lode is still about two feet wide, and worth 40*l.* per fathom; the lode in the winze, sinking below this level, is one foot wide, and worth 12*l.* per fathom. In the eighty fathom level, east of Wall's shaft, no alteration; the lode in the stopes, in the back of this level, is still about two feet wide, and worth 50*l.* per fathom. The lode in the seventy fathom level east, at Flapjack lode, is three feet wide, producing good stones of ore, with an improved appearance; in this level west the lode is eighteen inches wide, composed chiefly of mundic, spar, and capel, with a small proportion of ore. In the sixty-two fathom level, east of Wall's shaft, the lode is ten inches wide, with stones of ore. The tribute pitches are still looking favourable.

F. PHILLIPS.

TREGOLLAN MINING COMPANY.

Feb. 7.—I beg to inform you that the lode, in extending the forty fathom level east, is eighteen inches wide (the cross part), and worth about 3*l.* per fathom; this level is extended east from Baker's shaft about fifty-six fathoms, forty fathoms of which is productive ground, that will work at a moderate tribute. We have not yet intersected either of the lodes in the cross-cut going north at this level, but, from the end being very wet, and from other indications, we anticipate we are getting near the first northern lode. The ground is still hard in this end. The tribute pitches are looking much as usual.

JAMES NINNIS.

TINCROFT MINING COMPANY.

Feb. 8.—I beg to say that we have still a good lode in the new engine-shaft, sinking under the forty fathom level; the shaft is now about 4 fm. 3 ft. under the level; the lode is three and a half feet wide, worth from 30*l.* to 40*l.* per fathom. The lode in the forty fathom level east is about two feet wide, and worth from 12*l.* to 15*l.* per fathom, and likely to improve. We have commenced sinking a winze under the forty fathom level, east of the shaft, where the lode is two and a half feet wide, and worth from 25*l.* to 30*l.* per fathom; at the same level, to the west of said shaft, we are driving south, in order to ascertain if any part of the lode be in that direction, the lode on which we were driving west being in a disordered state. At the thirty fathom level, driving west on old Tincroft lode, we find a little copper ore, with plenty of mundic and some tin, altogether a kindly lode, though not rich. We are sinking Palmer's shaft as fast as possible, but still find the ground very hard. The appearance in the old mine continues much the same as for some time past. The price of tin being so very low throws a gloom over that part of our prospects. We are very cheering for copper ore in the north ground.

W. PAUL.

TRELIGH CONSOLS MINING COMPANY.

Feb. 5.—Having been much incommoded by water in the past week, we have done nothing in the bottom levels. The sixty west continues large, but not rich, worth 5*l.* per fathom. This level east is also a large lode, with ore, but at present not enough to value. In the fifty west the lode is four feet wide, ore throughout, worth 20*l.* per fathom. In the fifty east the lode is large, but not rich. Garden shaft continues to go down in favourable ground. The old sump-shaft is nearly down to our forty fathom level, but the lode has not come into the shaft yet. At Good Fortune Shaft the forty-four east is worth 8*l.* per fathom; this level west is five feet wide, worth but little for ore, though of a promising appearance.

W. SIMCOCK.

TRETOIL MINING COMPANY.

Feb. 7.—The lode in the thirty fathom level, east of Williams's shaft, is one foot wide, unproductive; two and a half fathoms driven last month—one and a half fathom very good tribute ground for copper, and one fathom good tribute ground. Tregellas's lode, driving west of Johns's shaft, at the thirty fathom level, is two feet wide—tribute ground for copper; two and a half fathoms driven last month, worth the same. Tregellas's lode, in driving east, is nine inches wide—tribute ground for copper; seven fathoms driven last month, with also tribute ground for copper; the lode in the rise, in the back of this level, is six inches wide—tribute ground for copper; five fathoms risen last month—tribute ground for copper. We have suspended the seventeen fathom level, east of Moreom's shaft, on the tin lode, and have set a pitch, which was taken at 1 farthing in the 1*l.*; six and a half fathoms driven last month, five fathoms very good tribute ground; one and a half fathom good tribute ground. We have suspended the rise in the back of the adit level, east of Moreom's shaft, on the tin lode, and have set a pitch at 1 farthing in the 1*l.*; three fathoms risen last month—very good tribute ground. We are driving an end east in the tin lode, about four feet wide, at this level—it is tribute ground for tin; four and a half fathoms driving last month, three fathoms good tribute ground; one and a half fathom tribute ground.

H. WILLIAMS.

WEST WHEAL JEWEL MINING ASSOCIATION.

Feb. 7.—The seventy cross cut, south from Buckingham's shaft, the ground is favourable. The seventy east, on the south branch, ground more favourable for driving; the lode not taken down since our last. The fifty-seven east, on the same lode, is fifteen inches wide, and worth 10*l.* per fathom. The fifty-seven east, on Wheal Jewel lode, is heaved by a slide, and we are driving to cut it again. The fifty-seven west, on this lode, is eighteen inches wide, with stones of yellow ore. The thirty west, on Tuscarora tin lode, is worth 15*l.* per fathom.

S. LEAN.

CARNBRIAN MINING COMPANY.

Feb. 4.—To-day is our public setting for this month, and have set sixteen pitches, as follow:—Four at Clifford's, employing twelve men, at 27*s.* 6*d.* per ton each tribute pitch, which is about 1*s.* 9*d.* in the 1*l.*; one at 2*l.* per ton; one at 3*l.* 10*s.*; two at 3*l.*; and eight others, varying from 5*l.* to 7*l.* per ton, employing forty-seven men altogether on tribute; also, eleven bargains, employing fifty men, on tutwork. In the sixty fathom level, going west, Chiverton lode continues large—three feet wide—and has a very promising appearance; occasionally it produces stones of ore at this level. In the sixty fathom, the south lode, going east, is about nine inches wide, yielding a little ore, but not at present rich. In the fifty fathom level winze, rising from the western end to the forty fathom level, we are leaving the lode stand until the winze is holed. In the thirty-two fathom level cross-cut, going north towards Clifford's shaft, and for the purpose of cutting the north lode, the ground is of a favourable character for lodes to pass through. The twenty-four fathom level, driving east of Clifford's, still contains a large lode, and a good channel of ground, but poor for ore. The sixteen, driving east, also is a kindly level, and making ground for tribute. At the eight fathom level we are rising, on the course of the lode, a shallow shaft, for footway, drawing the stuff which may be broke about that level, dividing the ground for tribute, &c.; have we have a good lode for a foot wide, and from this part a great deal of rich ore will be broken. On the whole, I am glad to say, the mine presents much encouragement.

E. ROWE.

UNITED HILLS MINING COMPANY.

Feb. 7.—Williams's Engine-Shaft—Lode four feet wide, producing but a small quantity of ore. Sixty Fathom Level, east of ditto—Lode 3 ft. 6 in. wide—two feet ore of a fair quality. Sixty Fathom Level, west of ditto—Lode six feet wide, coarse in quality. Fifty Fathom Level, Eastern Shaft—Lode 1 ft. 6 in. wide, good ore. Fifty Fathom Level, west of ditto—Lode five feet wide, grey throughout, but not rich. Diagonal Shaft—Lode four feet wide, with stones of ore. James's Shaft—Lode 3 ft. 6 in. wide—eighteen inches on the north part ore of average quality. Forty-six Fathom Level, east of Turton's Shaft—Lode three feet wide, producing but little ore. Forty-six Fathom Level, west of Turton's—Lode three feet wide, poor. Cross-Cut, north of James's Shaft—No lode cut as yet driving north. Thirty Fathom Level, east of Eastern Shaft—Lode 1 ft. 6 in. wide, with but very little ore. Twenty Fathom Level, east of Eastern Shaft—Lode two feet wide, producing a small quantity of ore, with a promising appearance.

N. LANGDON.

FOREIGN MINES.

IMPERIAL BRAZILIAN MINING ASSOCIATION.

Gold Report.—Raisings from November 13th to December 11th (twenty-five days), 66 lbs. 6 oz. 19 dwts.—Total, from July 1st to December 11th, 475 lbs. 3 oz. 4 dwts. 3 grs.

BRAZILIAN COMPANY.

Cata Branca, Nov. 24.—The inclosed gold report, in addition to showing that the lode stamped continues of a poorer quality, proves also that enough of it was not broken to keep the engines supplied. The latter circumstance has been owing to our deficient pumping power. I had hoped to have gone on without making any alterations until the new wheel was ready, but the heavy rains which we have lately had, threw more water into the mine than we could well get rid of. We have now put our standing lift cistern lower down, and I hope the bottom will not again be under water, to which circumstance, I believe, the lower than usual produce is attributable. Unquestionably our sump and No. 1 and 2 stopes west, are good ground, whereas the eastern part, from which the late supply came, is very poor. One of the cross lines, forming the Jacara, and which has not been distinguishable for some fathoms past, is again showing, and which I augur well of. The lode in shallow adit end west is widening, and looks promising, though as yet only the samples show gold. In one cross-cut to the Bahu (St. Antonio) the ground, within the last day or two, has become much more favourable, and, if it holds, will enable us to cut the lode next week. I trust it may be found good.

Nov. 29.—I hope we are getting into better ground, though, as you will perceive, we have not been able to break enough stuff to supply the engines. We have been somewhat hindered from having to get in timber, but with enough water I doubt our present force ever being able to keep them supplied, unless the stone becomes harder. The immense quantity broken lately must, I think, have astonished you. It is impossible for any ground to break better.

Dec. 4.—As I told you in my last, I believe we are getting into better ground. I may say, indeed, that I have never seen on our spalling floor better stone than was there yesterday. That portion of our lode close to the cross lines forming the Jacara is again assuming the same nature as when those cross lines were before strongly shown. There is no mistaking them, and it is nearly three years since we had them. I expected this coming week to send you a good gold report, but yesterday, unfortunately, the gudgeon of our pumping-wheel broke, which, I fear, will prevent our getting at the bottoms for a few days.

W. COTESWORTH.

Gold return for three weeks to 3d December, 30 lbs. 6 oz. 15 dwts. 12 grs.; ditto for the month of November, 66 lbs. 10 oz. 3 dwts. 2 grs.

BOLANOS MINING COMPANY.

[Some very important dispatches have been received from the Bolanos district, of which we have only space for the following letter, which gives, indeed, the whole of the particulars that would be interesting to the shareholders.]

Guadalupe, Dec. 1.—The silver introduced in the Mint of Zacatecas last month was 9849 mcs., in which amount is comprised the small quantity that remained on hand at Regona at the end of October—thus we are short of the quantity stated in my estimate for last month by about 700 mcs.; the reason is, that one torta of ore of San Clemente, incorporated at La Granja on the 9th ult., was not ready for washing, owing to several tortas being of less ley than I had anticipated; the deficit would have been still greater, but for some ounces and native silver which we smelted; in the latter substance the ore of San Clemente is very rich; indeed, it occurs in rather large specimens, and, about a week ago, in a small crevice, casually discovered by a blast, about 54 lbs. of native silver were found. The result of the workings of the mines and haciendas for November was as follows:—

Profit on San Clemente	$18,387	4 0
Ditto on San Nicolas	15,051	1 6
Ditto on haciendas	1,682	5 5
	$35,115	6 1
Deduct loss on small mines	1,501	7 0
Profit	$31,620	4 1
The Mint account shows a balance in our favour of	$82,294	4 6
The cash on hand, on the 27th ult., amounted to	1,800	0 0
	$65,914	4 6
And deducting for duties on silver	$2700	0 0
And for the expense of the present week	6000	0 0—8,700 0 0
The sum at our disposal at present is about	$56,914	4 6

The amount of silver which will probably be produced in the present month is 10,944 mcs.; the estimate comprehends only the tortas to be incorporated up to the 6th and 9th inst., so that there will be sufficient time for working all of them, unless the unfavourable weather and low temperature causes a delay in the process of amalgamation, there would be a profit on the mine of about 60,000 0 0

$116,914 4 6

And notwithstanding a dividend due to the owners of San Clemente and San Nicolas of $50,000; the loan due to Dr. Penn, $9000; ditto Mr. Smith, $9000; and the amount due to Mr. Lehman, $8170; and, probably, to Don Ramirez, about $3000.... .... 80,170 0 0

$ 36,370 4 6

So that there will be, I trust, at the end of the year, about $50,000 to be remitted to England, if the mines continue in the state they are now, which I have no doubt will be the case. With regard to the $10,000 I borrowed to complete the last remittance, I beg to observe, that it was returned in the middle of last month.

Dec. 3.—The torta of sixty-four mentons of ore of San Clemente, incorporated yesterday at Begona, assayed 98 mcs. per menton; and, as I suppose, the ley of two other tortas, of thirty-two and sixty mentons, to be incorporated on the 6th inst., will not be less. The amount of silver to be produced this month is likely to be considerably greater than 10,944 mcs.

Summary of Costs and Returns for October.

San Nicolas—Returns	$20,402	5 4
Costs	13,199	4 0
Profit	$7,202	1 4
San Clemente—Returns	$13,000	1 0
Costs	20,637	0 0
Profit	$26,434	1 6
Balance—Costs	$35,747	7 0
Returns	31,500	3 0
Loss*	$12,247	4 3

* The loss on the Balance negotiation ought, properly, to be stated as only $8113 5 6, the increased amount having been caused by several native and European servants of the company having been discharged, and their salaries paid to them, the whole amount of which is entered for this month.

REAL DEL MONTE MINING COMPANY.

Mineral del Monte, Dec. 4.—I have had the honour to receive the minute of the court of the 9th September, and am glad to observe that prompt attention will be paid to the dispatch of the stores; I hope, therefore, we may be enabled to avail ourselves of the healthy season to convey those effects at a low rate of freight. The Acoste engine was set to work on the 25th ult., and the manner in which it has been finished reflects great credit on the engineer, who has made it a very pretty and a very excellent machine. We shall now be able to turn our attention to the Dolores new engine. I have already mentioned that it was impossible to carry on the works for the erection of this engine while the engine at Acoste was in hand. Seeing the probability of an increasing silver produce from the discoveries at Acoste, I beg to remit herewith a bill on the British Treasury for 1000*l.*

Dec. 4.—(To the manager.)—The general prospects on the Biscaina vein have not varied since my last. In Taylor's cross cut we have met with a branch which has let down a good deal of water; we may, therefore, expect, in a short time, to drain the bottom of the Socorro level, and procure some ores from thence. We have favourable ground, and a kindly vein, in the Esperanza level, driving west of Guadalupe. San Bernardo winze has not been lately so good as it was at first; we see, therefore, opening ground, to examine the vein east and west of the winze. Upon the whole, the prospects in Acoste have improved within the last month. In a winze from the Fourteen vara level, over the ore ground, in the Guadalupe level, we have lately discovered some very good ores. No conclusion should be drawn as to the future produce of Acoste from the ore export for November, now forwarded, as we only worked upon the ore over the Guadalupe level about one week in that month. From what we have hitherto seen, the deposits of ore in Acoste are not of much extent in length or height, but very rich. The joint accounts of September and October showed a profit of $5100

MONEY MARKET AND CITY NEWS.

CURRENT PRICES OF ENGLISH AND FOREIGN FUNDS.

Consols Money, 89 ⅞	Danish, 3 per Cent., 81 2
Ditto Account, 89½ ⅞	Dutch, 2½ per Cent., 51⅞ ¼
New 3½ per Cents., 99⅞ ⅛	Ditto, 5 per Cent., 101⅛ ⅞
Reduced 3 per Cents., 89⅞ ⅞	Portuguese, 5 per Cent., 32 ¼
Reduced 3½ per Cents., 99⅞ ⅞	Ditto, 3 per Cent., 19 ¼
Long Annuities, 12⅛	Russian, 5 per Cent., 115½ 116½
Bank Stock, 167 8	Spanish, Actives, 5 per Cent., 24⅞ ⅞
Exchequer Bills, 23 25 pm.	Chili, 6 per Cent., 68 70
Belgian Bonds, 5 per Cent., 102⅞ 3½	Colombian, 6 per Cent., 21⅞ 2½
Brazil, 5 per Cent., 66 7	Mexican, 5 per Cent., 31⅞ 2

REMARKS ON THE OPERATIONS OF THE WEEK.

SATURDAY, Feb. 5.—The English funds opened firm, and Consols advanced to 89½ ⅞ for the Account, and 89⅞ ⅛ for money; but, in consequence of a sale of 50,000*l.* by an influential broker, prices receded a trifle, and the market closed with a heavy appearance.—Some favourable intelligence from Brazil caused an improvement in that stock, which now appears to have completely recovered its late depression; the business in Mexican stock was also good, and an additional rise of 1 per cent. occurred; other securities continue without alteration.—There was a decided improvement in the share market—most descriptions of railway shares were better, and business was brisker in every respect.—Hibernian Mining Association, 2½.—National Provincial Bank of England, 35.—Mexican and South American Co., 2⅞.

The commercial paper due yesterday was to a very large amount; it was met with promptness, and there were no material instances of dishonour.

We understand that Government wish to enter into a contract for 1200 tons of coal, to be shipped to Hong-Kong, in order to supply her Majesty's steam-ships in service on the Chinese seas.

MONDAY.—The Government securities were not so good to-day by ⅛ per cent.; the market opened heavily at the reduced quotation of 89⅞ to ⅞ for the Account—partly in consequence of the disastrous news from Affghanistan, of the defeat and slaughter of our troops, and from the unfavourable aspect of American affairs regarding the *Creole*, which obtained currency on receipt of news from Liverpool in the afternoon)—and ultimately receded to 89 for the Account and 89⅞ 9 for money; Bank Stock, 167½ 8½; India Bonds, 11s. 13s. pm.; the market for India Stock was very flat, the price was called 245 7, but there was no actual bargains done; Exchequer Bills, 17s. 19s. pm.—The only feature of importance in the foreign house was a further rise of 1 per cent. in Brazil Stock; Spanish was unfavourably influenced by the depressed state of the English market; Mexican maintained their firmness at 32 ¼; Brazilian 64 66.—The share market continues improving—the dealings were extensive, with firm prices; Bristol and Exeter were done at 26; Eastern Counties Debentures, 1 4; Great Western, 86½; Brighton, 38½; Blackwall, 11⅛; Birmingham, 172; South Western, 59½; Croydon Trunk, 11⅛; Northern and Eastern, 36½; and South-Eastern and Dover, 27.—Cobre Copper Mining Company, 33.—Colonial Bank, 26⅞; London Joint-Stock Bank, 12⅞; National Provincial Bank of England, 35.

TUESDAY.—The funds still continue depressed under the late unfavourable news from India and the United States; besides which, the Lisbon mail brings intelligence of a Chartist outbreak at Oporto, and the probability of a further rising in favour of Christina in Spain; this accumulation of gloomy news naturally produced considerable heaviness in the money market, and the national securities continued without animation all day. Consols for the Account opened at 88⅞ 9, and for money, 88⅞ ⅞, but, towards the close of business, however, prices assumed a somewhat firmer appearance; Exchequer Bills, 18s. to 20s. pm.—Portuguese Stock declined nearly 2 per cent., the closing price of the Fives being 31⅞ 2; Spanish Actives, 24⅞; Brazilian, 64 5½; and Mexican Bonds, 31⅞ 2½.—There was scarcely any change in the share market, business was not quite so brisk, but prices remain about the same.—Provincial Bank of Ireland shares were done at 40.

A slight advance was noted in the foreign exchanges, although not much business was transacted; Amsterdam, short, were negociated at 12 2½ 3; ditto, three months, 12 4½; Rotterdam, three months, 12 4½ ⅞; Hamburgh, 13 10⅞; and Paris, short, 25 45 50.

The premium on gold at Paris is 7 per mille, which, at the English Mint price of 3*l.* 17s. 10½*d.* per ounce for standard gold, gives an exchange of 25 32½, and the exchange at Paris on London at short being 25 42½, it follows that gold is 0·30 per cent. dearer in London than in Paris.

By advices from Hamburgh the price of gold is 429 per mark, which, at the English Mint price of 3*l.* 17s. 10½*d.* per ounce for standard gold, gives an exchange of 13 7, and the exchange at Hamburgh on London at short being 13 9½, it follows that gold is 0·98 per cent. dearer in London than in Hamburgh.

The course of exchange at New York on London is 109 per cent., and the par of exchange between England and America being 109 28-40 per cent., it follows that the exchange is 0·37 per cent. against England. But the quoted exchange at New York being for bills at sixty days' sight, the interest must be deducted from the above difference.

WEDNESDAY.—This was a quiet day in the money market, and the few transactions that took place occasioned but trifling variation in prices; the dealers being evidently on the *qui vive* for the expected exposition of ministerial intentions as regards the all-important subject of Corn Laws, in the House of Commons this evening, much business could not have been anticipated; the closing price of Consols for Money was 89 sellers, and for the Account, 89 buyers; Exchequer Bills improved 1s., the closing price being 19s. to 21s. premium.—The business in foreign securities was not extensive, but both Mexican and Spanish may be noted as firmer—the latter left off at about ⅛ better than the closing price of yesterday.—Railway shares were more in demand, and the quotations of some of the more accredited lines rather in advance.—Imperial Brazilian Mining Association, 8.—Union of Australia, new, 23⅞ ex div.

THURSDAY.—The Government measure for the future regulation of the corn trade (like all great measures ever were, and ever will be) has been viewed by different parties in different ways, in accordance with their respective interests, but, on the whole, it has been more favourably received than could possibly have been expected from the inflated arguments used, and the injudicious course pursued, by interested parties, in advocating the "popular indignation" against, what they are pleased to term, the "iniquity of all restrictive duties." From this feeling of increased confidence in the Ministry, the funds received considerable strength, and, although the dealings were of a limited nature, the English securities left off full ⅛ per cent. better than they opened; a demand for Exchequer Bills raised their premium to 22 to 24.—A great improvement took place in Spanish stock, which were left done at—Actives, 24⅞ ⅞; Deferred, 13 ⅞; Passives, 5⅞ ⅞.—There was no particular change in the share market, prices continue firm, with a steady demand.—Colonial Bank, 26⅞ ⅞; Provincial Bank of Ireland, 40⅞; ditto, new, 13⅞.

FRIDAY.—The English funds were steady throughout the day—the improvement of yesterday being fully maintained, with a fair amount of business doing; the closing money price of Consols were 89⅞ sellers, and for the account 89⅞ buyers; Exchequer Bills, 23s. 25s. pm.—The market for foreign securities was heavy, and without any transactions of magnitude; the advance in Spanish bonds was not maintained, the Actives, with the Coupons, declining to 24⅞ ⅞; Portuguese Fives, 32⅞; Brazilian, 65 6; Mexican, 31⅞ 2; Dutch 5 per Cents., 101⅞ ⅞; ditto 2½, 51⅞ ⅞.—Railway shares remain with little variation; the chief business to-day was in preparing for the settlement; Brightons were heavy at 38⅞ ⅞; Blackwalls, 11⅞ ⅞; South-Western, 59⅞ 60⅞; Greenwich, 4⅞; Northern and Eastern, 36.—Colonial Joint Stock Bank, 26⅞ ⅞; London Joint-Stock, 12⅞ ⅞.—General Steam Navigation Company, 14⅞.

The foreign exchanges were in advance again to-day, but not much business was transacted. Bills on Amsterdam were quoted 12 2½ ⅞; ditto, three months, 12 4½ ⅞; Antwerp, 12 4⅞; Hamburgh, 13 10⅞ 11; Marseilles, 25 60 62½; Trieste, 9 52 55; and Madrid, 36⅞.

WEEKLY STATEMENT OF LETTERS DELIVERED IN THE UNITED KINGDOM:—

Week ending the 22nd January, 1842	4,[illegible]
Week ending the 24th January, 1841	3,[illegible]
Week ending the 24th November, 1839	1,[illegible]
Increase since 1841 on the week's letters	[illegible]
Increase since 1839 on the week's letters	2,472,710

[*From our own correspondents.*]

LATEST PRICES OF IRISH STOCKS.—3 per Cent. Consols, 89⅞—3½ Stock, 97⅞—Ditto, New, 100⅞, 99⅞—3½ per Cent. Debentures, 97⅞—Bank Stock, 161⅞—Kingstown Railway, 8—Drogheda, 7⅞—National Insurance Company, 26—City of Dublin Steam Company, [illegible]—Grand Canal Stock, [illegible]—British and Irish Steam Company, 51⅞—Hibernian Bank, 25⅞—Royal Bank, 15⅞—Mining Company of Ireland, 14⅞—Wicklow Copper Mines, 14⅞.

PARIS, Feb. 10.—[illegible]

AMSTERDAM, Feb. [illegible]—[illegible]

BERLIN, Feb. [illegible]—[illegible]

BRUSSELS, Feb. [illegible]—[illegible]

HAMBURGH, Feb. [illegible]—[illegible]

HULL, Thursday.—[illegible]

LEEDS, Thursday.—Since we wrote our last circular an increase of confidence in the share market has been manifested, in anticipation of what may take place in the alteration of our commercial legislation, more particularly as regards the Corn Laws, upon which so much hinges at the present time; but, should the expectations of the country be baulked (at least the manufacturing and commercial part of it), we fear a reaction of a very unpleasant nature would occur. By this time (1 p.m., Thursday) but little is known of what Sir Robert intends to do; but that little is anything but cheering. At the generality of the meetings about to be held, great satisfaction will be given to the proprietors of railways, as they will manifest, in a striking manner, the prodigiously increasing development of this mode of transit, even in times of the most "frightfully" depressed kind that have been known since the years 1816 and 1817. Again, we ask, if railways can live, and some of them prosper, at such periods as we are now experiencing, what may we not expect from them when trade revives and commerce flourishes? To show the vast increase of traffic during the past six months of 1841, with the like period of 1840, we subjoin a statement of the amount of receipts on a few well-known railways now in operation—viz., in round numbers:—

	1841.	1840.
North Midland	£114,000	£74,000
York and North Midland	44,000	27,000
Hull and Selby	24,000	17,000
Midland Counties	70,000	47,000
London and South Western	151,000	141,000
London and Birmingham	434,000	407,000

Manchester and Leeds shares are not so brisk in demand as they were, being no more than 6*l.* to 5½*l.* pm.; Sheffield and Rotherham's are better than they were, whilst North Midland's are worse—the latter may be had at 70*l.*, the former at 23½*l.*; Hull and Selby's are quiet at 40*l.*, and so are Leeds and Selby's at 95*l.* ex div. We annex our quotations:—North Midland Railway, 70*l.*; York and North Midland, 8½*l.*; Leeds and Selby, 97½*l.*; Hull and Selby, 40*l.*; Great North of England, 90*l.*; Manchester and Leeds, 76*l.*; Sheffield and Rotherham, 23*l.*—Leeds Banking Company, 19; Leeds and West Riding, 9½*l.*; Leeds Commercial, 3½*l.*; Yorkshire District, 9*l.*; Yorkshire Agricultural and Commercial, 3½*l.*; York City and County, 20*l.*; York Union, 18½*l.*—Leeds and Liverpool Canal, 720*l.*; Barnsley, 230*l.*; Huddersfield, 39*l.*; Rochdale, 78*l.*—Leeds and Yorkshire Assurance Company, 13*l.*—Leeds Old Gas Company, 22½*l.*; Leeds New Gas Company, 37*l.*—Leeds Commercial Buildings, 24*l.*

R. B. WATSON & Co.

NEWCASTLE, Thursday.—There has been no material change since last week and but little business done.—North of England Joint Stock Bank, 4½*l.*; Northumberland and Durham District, 8½*l.*; Newcastle, Shields, and Sunderland Union, 7½*l.*; Newcastle-upon-Tyne Joint-Stock, 2½*l.*; Newcastle Commercial, 8½*l.*; Sunderland Joint-Stock, 6½*l.*; Darlington District, 4*l.*; Carlisle City and District, 20*l.*; Carlisle and Cumberland, 6½*l.*; Stockton and Durham County, 4½.—Newcastle and Carlisle Railway, 92*l.*; Newcastle and North Shields, 44*l.*; Brandling Junction, 45*l.*; Durham and Sunderland, 22*l.*; Clarence, 29*l.*; Hartlepool and Stockton, 85*l.*; Hartlepool Dock and Railway, 100*l.*; Great North of England, 80*l.*—Newcastle Union Shipping Company, 4*l.*; Port of Newcastle, 15*l.*; London, Newcastle, and South Shields, 5*l.*; Gateshead and Tyne, 16*l.*—North and South Shields Steam Ferry, 11*l.*—Newcastle Subscription Water Company, 27½*l.*—Newcastle and Gateshead Union Gas Company, 7½*l.*—Durham County Coal Company, 9½*l.*

EDINBURGH, Wednesday.—Edinburgh and Glasgow Railway, 45*l.*; Dalkeith and Edinburgh, 30*l.*; Glasgow and Greenock, 22½*l.*; Glasgow and Garnkirk, 40*l.*; Glasgow and Ayrshire, 37*l.*; Wishaw and Coltness, 40*l.*; Dundee and Arbroath, 22*l.*; Arbroath and Forfar, 22*l.*

BRISTOL, Friday.—Our market still remains dull and inactive, and without any material alteration in prices since my last.—Great Western Railway, 85*l.* to 86*l.*; halves, 60*l.* to 60½*l.*; fifths, 9½*l.* to 9½*l.*; Bristol and Exeter (70*l.* paid), 36*l.* to 37*l.*; Bristol and Gloucester (15*l.* paid), 5*l.*; Birmingham and Gloucester, 62*l.* to 64*l.*; Cheltenham Union, 14½*l.* to 15½*l.*; Taff Vale, 65*l.*—Bristol Gas Company, 42*l.*; Clifton, 23*l.* to 25*l.*

LIVERPOOL, Thursday.—Grand Junction Railway, 184½*l.*; Lancaster and Preston, 30*l.*; Liverpool and Manchester, 191*l.*; North Union, 78*l.*; Paris and Rouen, 14½*l.*; York and North Midland, 90*l.*—Albion Bank, 25½*l.*; Borough, 13½*l.*; Bank of Liverpool, 18½*l.*; Liverpool Banking Company, 7½*l.*; Manchester and Liverpool District, 10½*l.*; North and South Wales, 4½*l.*; Royal, 67½*l.*; South Lancashire, 4½*l.*; Union, 10½*l.*

MANCHESTER, Thursday.—Manchester and Birmingham Railway, 29½*l.*; Manchester, Bolton, and Bury, 30½*l.*; Manchester and Leeds, 76*l.*—Bank of Manchester, 4½*l.*; Stockport, 7½*l.*; Manchester and Liverpool District, 10½*l.*; Manchester and Salford, 10*l.*; South Lancashire, 4½*l.*; Union of Manchester, 6½*l.*—Manchester Fire and Life Assurance Company, 9½*l.*—Union Plate Glass Company, 6½*l.*

BIRMINGHAM, Thursday.—London and Birmingham Railway, 171*l.* to 173*l.*; Great Western, 85*l.* to 86*l.*; London and South-Western, 59½*l.* to 60*l.*; London and Brighton, 36*l.* to 37*l.*; Birmingham and Derby, 50*l.* to 52*l.*; Birmingham and Gloucester, 62*l.* to 63*l.*—Birmingham Banking Company, 29½*l.* to 29½*l.*; Birmingham and Midland, 31*l.* to 32*l.*; Birmingham and Staffordshire, 78½*l.* to 79*l.*

SALE OF COPPER ORES IN CORNWALL

Sampled Jan. 20, and Sold at Andrews's Hotel, Redruth, Feb. 10.

Mines.	Tons.	Price.	Purchasers.	Mines.	Tons.	Price.	Purchasers.
Wh. Virgin	166	£5 0 6	Vivians.	Trewavas	160	5 5 0	Nevill & Co.
ditto	98	5 4 6	—	Wh. Provid.	57	6 16 6	Williams.
ditto	87	5 9 0	Nevill & Co.	ditto	15	23 0 0	Vivians.
ditto	55	2 7 6	Vivians.	ditto	8	5 17 6	—
Fowey C.	83	6 11 6	Williams.	Provid. M.	74	4 17 0	Nevill & Co.
ditto	90	5 2 6	Vivians.	Wh. Curtis	19	7 1 0	Freemans.
ditto	79	4 12 6	—	ditto	19	7 1 0	Williams.
Friendship	48	4 11 6	Nevill & Co.	ditto	32	5 17 0	Vivians.
ditto	54	4 12 0	—	Sth. Neptune	19	7 1 0	Freemans.
ditto	29	2 5 6	Vivians.	Chippendale	16	6 2 0	Nevill & Co.
Wh. Prosper	13½	5 7 6	—	Bodnick	7½	6 18 6	Freemans.
ditto	13½	7 7 6	Freemans.	ditto	7½	6 18 6	Williams.
Levant	60	7 15 0	Williams.	Wh. Mary	10	2 2 0	—
ditto	50	6 6 6	—	Berriman's ore	7	2 4 6	—
ditto	20	22 17 0	Vivians.				

TOTAL PRODUCE.

Wh. Virgin	354	£1592 4 6	Providence Mines 74	£358 18 0
Fowey Consols	242	1321 3 0	Wh. Curtis 70	391 3 0
Wh. Friendship, Wh. Prosper	152	601 1 0	South W. Neptune 19	133 19 0
Levant	148	1813 5 0	Wh. Chippendale 16	97 12 0
Wh. Trewavas	160	813 0 0	Bodnick 15	103 17 6
Wh. Providence	80	770 14 6	Wh. Mary 10	21 0 0
			Berriman's ore 7	15 11 6

Average standard, 121*l.* 3s.—Average produce, 7½.—Average price, 5*l.* 17s. 6*d.*—Quantity of ore, 1268 tons.—Quantity of fine copper, 91 tons 8 cwt.—Amount of money, 7342*l.* 7s. 6*d.*—Average standard of last sale, 123*l.* 16s.—Average produce, 6½.

COMPANIES BY WHOM THE ORES WERE PURCHASED.

	Tons.	Amount.
Vivian and Sons	580½	3177 12 0
Freeman and Co.	59	365 1 3
Sims, Willyams, Nevills, Druce, and Co.	394	1945 15 6
Williams, Foster, and Co.	201½	2153 18 3
Total	1268	£7342 7 0

Copper ores for sale on Thursday next, at Andrew's Hotel, Redruth.—Mines and Parcels.—Treasavean, 371; Fowey Consols, 391; Holmbush, 290; Wheal Gorland 55; Tregullan, 34.—Total, 1141 tons.

Copper ores for sale on Thursday week, at Pearce's Hotel, Truro.—Mines and Parcels.—[illegible]—Total, 3211 tons.

SALE OF COPPER ORES AT SWANSEA.

Sampled Jan. 19, and sold on the 9th of Feb.

[illegible]

TOTAL PRODUCE.

[illegible]

Total tons, 1735.—Total amount, £20,[illegible] 0 0

COMPANIES BY WHOM THE ORES WERE PURCHASED.

	Tons.	Amount.
English Copper Company	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Sims, Willyams, Nevills, Druce, and Co.	[illegible]	[illegible]
Vivian and Sons	[illegible]	[illegible]
Williams, Foster, and Co.	[illegible]	[illegible]
Total	[illegible]	£21,[illegible] 0 0

Copper ores for sale Feb. 23.—Cobre 117, [illegible]

SALES OF BLACK TIN,

By Ticket, on the 8th of February, at Penzance.

[illegible]

Total tons, 17½.—Amount, £750 7 6.

LATEST CURRENT PRICES OF METALS.

LONDON, FEBRUARY 11, 1842.

	£	s.	d.
IRON, Eng.—Bar ton 0 0 0 to	7	0	0
Do. Carg. in Wales	6	0	0
Hoops ton	9	0	0
Sheets ton	10	0	0
Pig, No. 1 ton	5	0	0
Do. in Wales	4	5	0
Foreign—Duty 20s. per ton. Swedes, on. bd. ton	13	0	0
Russian com. ton	14	0	0
P.S.I. ton	15	0	0
C.C.N.D. ton	16	0	0
STEEL, Eng. Blistered, 25 0 0 to	45	0	0
Shear do. do. 45 0 0 ..	54	0	0
Cast do. do. 45 0 0 ..	54	0	0
Foreign—Duty 20 per cent. Swedes in kgs bd. ton	19	0	0
Do. Faggots bd. ton	20	0	0
Milan bd. ton	0	0	0
COPPER, Brit.—Cake ton	98	0	0
Tile do.	96	0	0
Sheets lb.	0	0	11¼

	£	s.	d.
COPPER—Foreign (dy. 37s.)	—		
TIN, Brit.—Blocks cwt	3	11	0
bars do.	3	12	0
Banca 0 0 0 to	3	11	0
Straits 0 0 0 to	3	8	0
Tin Plates—I.C. (box) 1 10 0 to	1	12	0
I.X. do. 1 16 0 to	1	18	0
(Others in proportion.)			
LEAD, Brit.—Pig ton	19	10	0
Sheet ton	20	5	0
Shot ton	21	15	0
Red ton	20	5	0
White (dry) ton	24	0	0
Do. (gd. in oil) ton	22	0	0
Foreign—Span. (dy. 40s.)	19	10	0
SPELTER 0 0 0 to	27	10	0
For delivery 0 0 0 to	27	0	0
English Sheets 40*l.* to	31	0	0
QUICKSILVER—(dy. 1d. per lb.)	0	4	0

REMARKS.—The metal market generally is without animation, at the prices. It is said about 700 out of the 1000 tons put up by the Miners' Company have been sold, at prices about 65s. 6*d.* for blocks, and 67s. for bars, net.

EXPORTATION OF GOLD AND SILVER.—By the official return published by the Customs, the export of the precious metals from the port of London to foreign and colonial ports, for the week ending Thursday last, was as under:—

Silver coin to Belgium ... 12,000 ounces.

The quantity of silver coin and bullion shipped at Dover in the month of January for Calais amounted to 449,450 oz.

CURRENT PRICE OF GOLD AND SILVER.

Foreign Gold in Bars .. per oz.	£3 17 9	New Dollars ... per oz. £0 4 9
.. .. Portugal pieces	3 17 5	Silver in Bars (standard) ... 0 4 11

COAL MARKET LONDON.

MONDAY.—Price of coals per ton at the close of the market:—Buddle's West Hartley 19—Carr's 19—Holywell Main 18 6—New Tanfield 16—Ord's Redheugh 16—Original Windsor Pontop 17—Ravensworth's West 17 6—Hartley 17 6—Taylor's 18—West Hartley 19 6—Wylam 17 6—Blyth 15 9—Cowpen 18 6—Wall's End Bell and Browne 19 9—Bewicke and Co. 20 3—Clennell 18—Heaton 20—Hilda 19—Killingworth 19 6—Riddell's 19 6—Belmont 21 3—Braddyll's Hetton 21 6—Haswell 21 3—Hetton 21 3—Lambton 21 3—Russell's Hetton 21 3—Stewart's 21 9—Whitwell 20—Cassop 21 6—Hartlepool 21 6—Heugh Hall 21 6—Kelloe 21 6—Tennant's Hartlepool 20 6—Adelaide 21 3—Brown's Deanery 20 3—West Tees 18.—Ships arrived since last sale, 69.

WEDNESDAY.—Adair's Main 16 6—Bell Robson's Hartley 17—Old Tanfield 16—Original Windsor Pontop 17—Ravensworth's West Hartley 17—Tanfield Moor Butes 17—Wylam 17 6—Wall's End Bell and Browne, 19 9—Clarke and Co. 17—Heaton 19 6—Hedley 19 3—Killingworth 19—Newmarch 17 6—Northumberland 16—Wharncliffe 19 6—Braddyll's Hetton 21—Haswell 20 9—Hetton 21—Lambton 20 6—Lumley 17 6—Pemberton 19 6—Russell's Hetton 21—Stewart's 21 6—Hartlepool 21—Barrington Tees 17 6—Seymour Tees 19 3—West Tees 18—Blyth 15 6—Hartley 18 6—Howard's Netherton Main 17 6—Ships arrived 13.

FRIDAY.—Buddle's West Hartley 18—Ord's Redheugh 16—Ravensworth's West Hartley 17—Wall's End Derwent 15—Heaton 20—Killingworth 19—South Killingworth 16 3—Braddyll's Hetton 21—Haswell 21 3—Hetton 21—Lambton 21—Stewart's 21 6—Whitwell 19 9—Caradoc 21 9—Hartlepool 21—Tennant's Hartlepool 20—Barrett 20 3—Bowburn 15 6—South Durham 19 3—Tees Hetton 16 6—Blyth 15 6—Cowpen 18.—Ships arrived, 17.

PRICES OF MINING SHARES.

Shares.	BRITISH MINES.	Paid.	Price	Shares.	BRITISH MINES.	Paid.	Price
400	Anglesey	5	—	6,000	Tin Croft	6½	3½
4,000	Bissoe Bridge	5	1½	4,300	Tretoil	1½	2½
20,000	British Iron	70	6 dis	1,000	Trevidgia	5	6
8,000	Blaenavon	45	20	170	Treviskey and Barrier	—	170
120	Brewer	—	120	96	Treasavean	—	1000
79	Bodnick	—	100	120	Trethelian	—	250
1,000	Carn Brea	—	110	4,000	United Hills	5	6½
100	Copper Bottom	41	30	6,000	Wicklow Copper	5	12
2,000	Cornubian Lead Co.	2	4	3,845	West Wheal Jewel	9	4½
6,000	Cornwall Great United	10½	½	1,000	Wheal Julia	—	6½
	Caddra	10	½	128	Wheal Kitty	—	60
512	Cook's Kitchen	—	50		**FOREIGN MINES.**		
112	Charlestown	—	600	5,000	Alten Mining Company	12½	6
5,000	Dartmoor Consols	5	1½	10,000	Anglo Mexican Co.	100	½
10,000	Durham County Coal Co.	37	9	8,374	Do. Subscription	25	1
2,000	Danescombe	—	2	2,000	Bolanos	150	5
6,000	De Dunstanville	—	—		Ditto Scrip	15	6 3½
1,000	Duffield	30	11	10,000	Brazilian Imperial	20	8
1,200	East Mulberry Hills	3½	1	10,000	Bolivar	20	½
256	East Pool	—	420	10,000	Ditto Scrip	10	2
4,000	East Tretoil	1	½	10,000	Cata Branca Brazilian Co.	4½	7½
5,200	Great Wh. Prosper	7½	6½	10,000	Cocoes Brazilian Co.	4	—
14,000	Great Wh. Charlotte	3	1½	12,000	Cobre Copper Company	40	33½
10,000	Hibernian	12½	2½	8,000	Colombian Co. regis.	55	2
1,000	Holmbush	14	20	10,000	Copiapo Mining Co.	13½	9
2,000	Isle of Sark (Guernsey)	11	18	20,000	General Mining Asso.	18	2
20,000	Mining Co. of Ireland	7	13½	5,051	Mexican Company	58	2
6,000	Polbreen	4	1	12,000	Morasinos and Cocoes	25	4½
3,000	Polberou Consols	10	½	14,302	Real del Monte, regis.	404	2½
2,000	Relistian	—	½		Do. unregistered	—	3
4,000	Redmoor Consolidated	5	1½		Ditto Loan Notes	120	16
10,000	Rhymney Iron	50	16	7,000	Royal Santiago	10	17½
100	Rosewall Hill	100	170	11,000	St. John d'el Rey	14½	2
500	South Towan	10	1	20,000	United Mexican	40	1
4,000	Tregullan	4½	½		Black Scrip, addl. capital	5	2
4,000	Treleigh Consols	4½	4½		Red New Scrip	5	3½
4,335	Tamar Consols	5	1½				

RAILWAY SHARE LIST AND TRAFFIC RETURNS.

Line.	Entire Lgth.	Now Open.	Present actual cost.	Pd. on Share.	Val. of Share.	Last week's Returns.
Arbroath and Forfar Railway	15	15	£ 131,845	25	22	£187 7 1
Birmingham & Derby Junc.	48	38½	853,044	100	59 0	1020 17 6
Birmingham and Gloucester	52½	51	1,912,723	100	62½	1392 0 0
Brandling Junction	25	25	437,094	45	—	—
Chester and Birkenhead	14½	14½	426,664	50	30	401 19 6
Dublin and Kingstown	6	6	333,590	100	77½	—
Dundee and Arbroath	16½	16½	134,904	30	25	210 1 0
Eastern Counties*	126½	17½	1,476,170	25	9 8½	567 2 4
Glasgow and Ayr	51	40	695,345	40	40	849 17 9
Glasgow and Paisley Joint	7½	7½	250,000	22	25	404 5 9
Gd. Junc. & Chester & Crewe	115½	115½	2,192,047	100	191 99	7166 0 9
Great North of England	73	45	1,000,000	100	80	1241 8 1
Great Western	118	118	5,386,044	65	86 5½	11562 14 3
Hull and Selby	31	31	400,000	50	40½	709 9 8
Lancaster & Preston Junc.	20½	20½	380,000	43½	37½	473 12 8
Liverpool and Manchester	31	31	1,410,000	100	191½ 2	4277 3 6
London and Birmingham	112½	112½	5,794,907	90	170	14587 4 9
London and Blackwall	3½	3½	997,000	25	11½	612 12 11
London and Brighton	46½	46½	2,000,000	50	38½ 3½	1121 8 0
Ditto Shoreham Branch	5½	5½				119 8 4
London and Croydon	10½	10½	547,000	13	11½ ½	291 2 9
London and Greenwich	3¾	3¾	793,315	20	4½	825 12 0
London and South Western	90	77	2,200,967	38½	60 ½	3061 1 10
Manchester, Bolton, & Bury	10	10	770,000	95	75	610 3 9
Manchester & Birmingham	45	5	1,104,917	40	29½ 0	502 16 7
Manchester and Leeds	50	50	2,530,000	70	77 8½	3002 7 3
Midland Counties	57	57	1,400,000	100	83	2000 1 10
Newcastle and Carlisle	60½	60½	750,000	100	94	1322 12 0
Newcastle and N. Shields	7	7	262,077	50	44	200 10 0
Northern and Eastern†	32½	32½	800,000	45	36½ 5	800 3 9
North Midland	72½	72½	2,930,000	100	70	2521 12 0
North Union	20	20	600,000	75	72½	1080 19 10
Preston and Wyre	19½	19½	270,000	50	50	209 11 9
Sheffield and Manchester	40	?		50½	—	348 9 9
Ulster	25	8	270,240	22½	—	404 7 9
York and North Midland	29	29	447,300	50	97 99	1314 0 11

* Including Northern and Eastern Railway toll. † Rent and toll to Eastern Counties (about 150*l.* per week) included in the returns. ‡ The Liverpool and Manchester toll is deducted.

THE LONDON GAZETTE—BANKRUPTS.

TUESDAY.—R. Littledyke, Bradnell-place, New North-road, linendraper—L. Whitby, Green Dragon-yard, Whitechapel, builder—M. and M. S. Schlesinger, Basinghall street, merchants—J. Woodcock, Stratford, Essex, builder—W. Vials, Old [illegible] street, [illegible]—G. Thomson and J. Forbes, Crutchedfriars, [illegible]—J. Miller, Stockton-on-Tees, Durham, patent oil cloth manufacturer—[illegible]

FRIDAY.—[illegible]

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